TROND ANDERSEN[1] & RALPH W. HOLZENTHAL[2]

[1]*Museum of Zoology, University of Bergen, Norway*
[2]*Department of Entomology, University of Minnesota, U.S.A.*

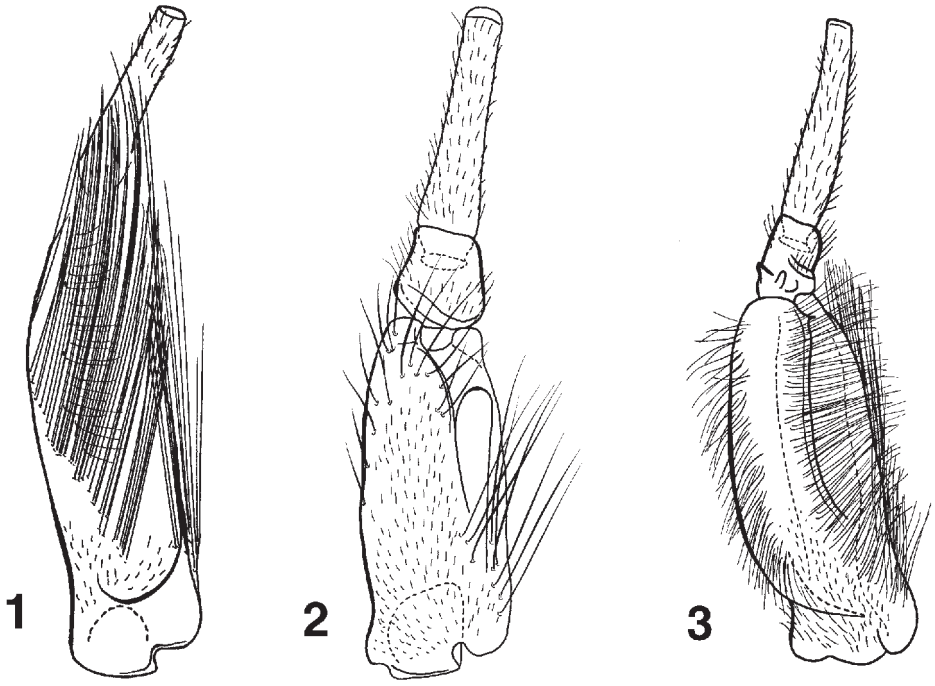
WEST AFRICAN *TRIAENODES* MCLACHLAN (TRICHOPTERA: LEPTOCERIDAE). 2. SUBGENUS *TRIAENODES* SENSU STRICTO

Andersen, T. & R. W. Holzenthal, 2002. West African *Triaenodes* McLachlan (Trichoptera: Leptoceridae). 2. Subgenus *Triaenodes* sensu stricto. – Tijdschrift voor Entomologie 145: 61-88, figs. 1-62, table 1. [ISSN 0040-7496]. Published 1 June 2002.
Seven new *Triaenodes* McLachlan species belonging to subgenus *Triaenodes* sensu stricto, *T. akua* sp. n., *T. kofi* sp. n., *T. kwabena* sp. n., *T. kwaku* sp. n., *T. kwame* sp. n., *T. kwasi* sp. n., and *T. yaw* sp. n., are described and figured based on males collected in Ghana. Adult males of the seven previously described species recorded from West Africa, *T. africanus* Ulmer, *T. darfuricus* Mosely, *T. elegantulus* Ulmer, *T. imakus* Gibbs, *T. scottae* Gibon, *T. tofanus* Gibbs, and *T. troubati* Gibon are redescribed and figured. A key to the males of the West African species of *Triaenodes* sensu stricto is provided.
Correspondence: T. Andersen, Museum of Zoology, University of Bergen, Muséplass 3, N-5007 Bergen, Norway. E-mail: trond.andersen@zmb.uib.no
Key-words. – Trichoptera, Leptoceridae, Triaenodini, *Triaenodes,* sp. n., Ghana, West Africa

In a preliminary check-list of the caddisflies of Ghana, Kjærandsen & Andersen (1997) listed 17 species of the long-horned caddisfly genus *Triaenodes* from the country, of which nine were assumed to be undescribed. Later an additional new species was found. In a previous paper Andersen & Holzenthal (2001) described and placed two of the new species in the subgenus *Triaenodella* Mosely. A third new species, *T. kwadwo* Andersen & Holzenthal was also described; this species is not easily placed in any subgenus. Further, all previously described species in the subgenus *Triaenodella* occurring in West Africa (Benin, Burkina, Cameroon, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo) were redescribed and figured. In the present paper, we describe and figure seven new species belonging to subgenus *Triaenodes* sensu stricto and redescribe seven species known from the Region including *T. elegantulus* Ulmer, not previously recorded from West Africa.

When erecting the genus *Triaenodella* for two East African species, *T. cheliferus* and *T. clavatus,* Mosely (1932a) stated that the genus was separated from *Triaenodes* mainly by the scent-organ apparatus in the male, situated in the scape of each antenna. The scent organ takes the form of a tuft of specialized scent-hairs arising at the extreme base of the scape and is covered by a hinged flap. *Triaenodella* was subsequently treated as a subgenus of *Triaenodes* by Ross (1944), based on the presence in *Triaenodella,* or absence in *Triaenodes* sensu stricto, of a male antennal scape scent organ.

Yang & Morse (1993) outlined the phylogeny of the Triaenodini and divided *Triaenodes* into three subgenera including their newly erected subgenus *Austrotriaena* for 8 species occurring in the Oriental and Australian biogeographical regions. They further redefined *Triaenodella* stating that most *Triaenodes* species have a male antennal scape scent organ. Subgenus *Triaenodella* Mosely sensu Yang & Morse is characterized in the males by the basal plate process of the inferior appendage secondarily absent, and the mesal basodorsal process of the inferior appendage curved caudad and ventrad, with an enlarged apex which is either clavate, broadly truncate, or subdivided into two processes. Subgenus *Triaenodes* sensu stricto, is characterized in the males by an abbreviated basal plate of the inferior appendage with a long, slender, recurved process, and the phallus with distinctive lateral ridges for resting or guiding the slender process of the basal plate (Yang & Morse 1993).



Figs 1-3. Scapes with scent organ. – 1, *Triaenodes akua* sp. n.; 2, *Triaenodes darfuricus* Mosely; 3, *Triaenodes kwabena* sp. n.

The present paper forms part of the scientific results of a joint project on freshwater entomology in Ghana established in 1991 between the Institute of Aquatic Biology, C.S.I.R., Ghana, the Department of Zoology, University of Ghana, and the Museum of Zoology, University of Bergen, Norway.

Material and methods

Methods used in preparing, examining, and illustrating genitalia are those that are commonly used in the study of Trichoptera (see Blahnik 1998). The terminology is adopted from Morse (1975), Schmid (1980, 1994), and Yang & Morse (1993). The measurements, in millimeters, are given as the range followed by the mean when more than three specimens are measured.

The descriptions of the new species are all based on males collected in Ghana. The redescriptions of most of the West African *Triaenodes* species are also based on Ghanaian material. However, two of the species, *T. africanus* Ulmer and *T. scottae* Gibon, were not taken in Ghana during the project. The holotype of *T. africanus* located in the Nationaal Natuurhistorisch Museum, Leiden, is damaged, and the redescription is based on a specimen from Cameroon identified as *T. africanus* by Ulmer (1912) housed in the Museum für Naturkunde, Berlin. Type material of *T. scottae* in the Muséum National d'Histoire Naturelle, Paris, was not available for loan, but Dr. François-Marie Gibon kindly provided two males from Mali. Further, for comparative purposes, the holotype of *T. darfuricus* Mosely was borrowed from the Natural History Museum, London, and the redescription is partly based on this specimen. In addition, material of several species of *Triaenodes* was borrowed from the National Museum of Natural History, Washington, D. C.

Holotypes and paratypes of the species described below as well as material of most of the species redescribed are deposited in the University of Minnesota Insect Collection, St. Paul, Minnesota, U.S.A.; paratypes and material of species redescribed are also deposited in the Museum of Zoology, University of Bergen, Norway, and the National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A. If not otherwise stated, the specimens are preserved in alcohol.

The following codes are used to indicate the collections in which specimens are deposited:

BMNH The Natural History Museum, London, England.

F.M.G. Private collection of François-Marie Gibon,

Assas, France
MNHN Muséum National d'Histoire Naturelle, Paris, France
USNM National Museum of Natural History, Washington, D.C., U.S.A.
UMSP University of Minnesota Insect Collection, St. Paul, Minnesota, U.S.A.
ZMHB Museum für Naturkunde der Humboldt-Universität, Berlin, Germany
ZMUB Museum of Zoology, University of Bergen, Bergen, Norway
RMNH Nationaal Natuurhistorisch Museum, Leiden, The Netherlands
NHRS Naturhistoriska Riksmuseet, Stockholm, Sweden

Systematic part

Subgenus *Triaenodes* sensu stricto

As defined by Yang & Morse (1993) the subgenus is characterized in the males by an abbreviated basal plate of the inferior appendage with a long, slender, recurved process, and the phallus with distinctive lateral ridges for resting or guiding the slender process of the basal plate. Most of the West African species fit the subgenus description well. However, we also include some species which have a weak abbreviated basal plate and a short curved process, which in a few species is club-shaped. The species included have a male scape scent organ with hinged flap, but apparently lacking tuft of scent-hairs (figs. 1-3).

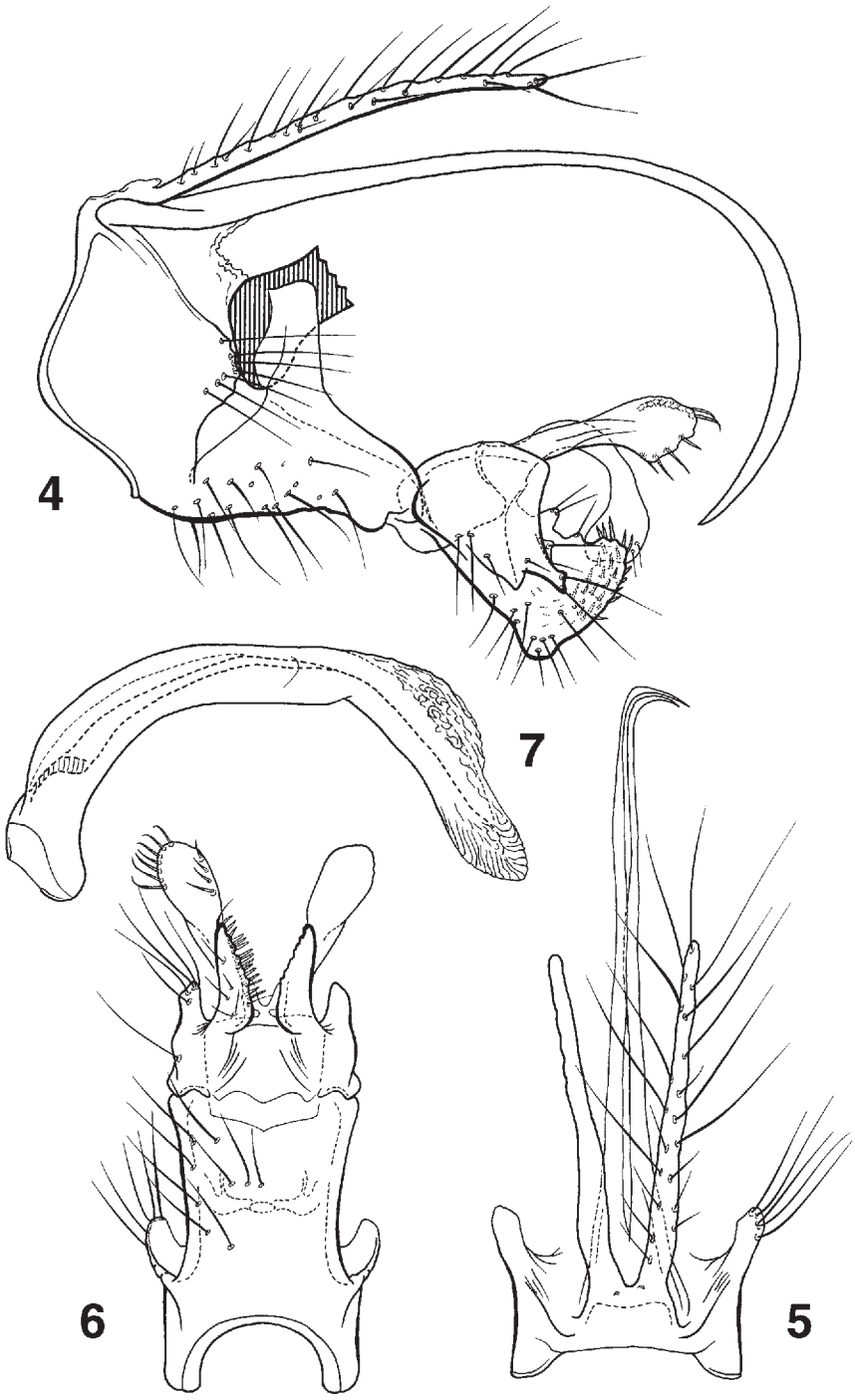
Of the West African species, seven previously described species apparently belong in this subgenus, and a further seven newly described species are placed in the subgenus (table 1).

Table 1. Check-list of West African *Triaenodes* McLachlan species. Subgenus *Triaenodes* sensu stricto.

Species	Distribution
T. africanus Ulmer, 1907	Niger, Cameroon
T. akua sp. n.	Ghana
T. darfuricus Mosely, 1936	Sudan, Algeria, Democratic Republic of the Congo, Ghana, Ivory Coast, Senegal
T. elegantulus Ulmer, 1908	Tanzania, Angola, Democratic Republic of the Congo, Ghana, South Africa, Uganda, Zimbabwe
T. imakus Gibbs, 1973	Ghana
T. kofi sp. n.	Ghana
T. kwabena sp. n.	Ghana
T. kwaku sp. n.	Ghana
T. kwame sp. n.	Ghana
T. kwasi sp. n.	Ghana
T. scottae Gibon, 1982	Ivory Coast, Mali
T. tofanus Gibbs, 1973	Ghana, Liberia
T. troubati Gibon, 1982	Ivory Coast, Ghana
T. yaw sp. n	Ghana

Key to the males of West African *Triaenodes* McLachlan, subgenus *Triaenodes* sensu stricto

1. Mesal basodorsal process of inferior appendage present (figs. 4, 12, 21) 2
– Mesal basodorsal process of inferior appendage absent (figs. 8, 46, 50) 8
2. Mesal basodorsal process of inferior appendage enlarged apically, with rounded (figs. 4, 59) or scalloped posterior margin (fig. 42) 3
– Mesal basodorsal process of inferior appendage at most weakly enlarged apically (figs. 12, 38), bilobed (fig. 21), or subdivided into two processes (fig. 34) 5
3. Recurved processes of basal plate asymmetrical, long, narrow, tapering (fig. 59) ..... *T. yaw* sp. n.
– Recurved processes of basal plate short, blunt or with club-shaped apex 4
4. Lower part of tergum X a strong sinuous spine projecting caudad, in dorsal view split at two thirds length; mesal basodorsal process of inferior appendage triangular in distal half, with scalloped, weakly rounded posterior margin (figs. 42-43) ..... *T. kwasi* sp. n.
– Lower part of tergum X long, narrow, pointed, curved ventrad, in dorsal view split to base; mesal basodorsal process of inferior appendage club-shaped (figs. 4-5) ..... *T. africanus* Ulmer
5. Basal plate of inferior appendage with recurved process forked medially (fig. 34) *T. kwaku* sp. n.
– Basal plate of inferior appendage with recurved process simple 6
6. Inferior appendage subtriangular (fig. 38) .... *T. kwame* sp. n.
– Inferior appendage basally subrectangular with pointed projections distally (figs. 12, 21) 7
7. Inferior appendage with posteroventral corner produced in long, narrow, slightly curved projection; apicomesal lobe narrowly triangular; mesal basodorsal process long, curved posterodorsad, shallowly forked (fig. 21) ..... *T. imakus* Gibbs
– Inferior appendage with posteroventral corner produced in short, triangular, straight projection; apicomesal lobe broadly triangular; mesal basodorsal process slightly sinuous, enlarged subapically, apex rounded with two long setae, projecting anterodorsad (fig. 12) .... *T. darfuricus* Mosely
8. Tergum X with both upper and lower part present 9
– Tergum X with only one part present, either upper or lower part 12



Figs 4-7. *Triaenodes africanus* Ulmer, ♂ genitalia. – 4, Lateral; 5, dorsal; 6, ventral; 7, phallus, lateral.

9. Both upper and lower part of tergum X consisting of paired processes (figs. 46-47) .... *T. scottae* Gibon
– Both upper and lower part of tergum X consisting of single, median process 10
10. Recurved processes of basal plate short, not reaching apex of inferior appendage; lower part of tergum X a long, curved median spine (fig. 25) .. ..*T. kofi* sp. n.
– Recurved processes of basal plate reaching apex of inferior appendage; lower part of tergum X in dorsal view wide basally, either triangular or with deeply split apex 11
11. Upper part of tergum X strong, slightly curved spine projecting caudad; inferior appendage rounded apically, lacking spine-like setae mesally (fig. 8) ..... *T. akua* sp. n.
– Upper part of tergum X narrow, strongly curved spine projecting ventrad; inferior appendage truncate, with spine-like setae mesally (fig. 29) .. ..*T. kwabena* sp. n.
12. Upper part of tergum X reduced; lower part of tergum X triangular, with rounded ventral margin, in dorsal view with V-shaped incision in apical one third (figs. 17-18) .. *T. elegantulus* Ulmer
– Upper part of tergum X with single median spine; lower part of tergum X reduced (figs. 50, 55) 13
13. Preanal appendage short, rounded; inferior appendage in ventral view with apex bearing a small, toothed projection (figs. 50-52) .... *T. tofanus* Gibbs
– Preanal appendage long, narrow; inferior appendage in ventral view with apex broadly rounded, without toothed projection (figs. 55-57) .... *T. troubati* Gibon

Triaenodes africanus Ulmer
(figs. 4-7)

Triaenodes africanus Ulmer, 1907a: 14, figs. 19-21. Type locality: NIGER: Warri; RMNH; ♂.

Triaenodes africanus Ulmer. – Ulmer 1907b: 141; Ulmer 1909: 362 [list]; Ulmer 1912: 110; Lestage 1919: 316, 317, 329 [list]; Mosely 1932b: 133 [list]; Kimmins 1956: 144 [list]; Fischer 1965: 78 [catalogue]; Fischer 1972: 79 [catalogue]; Morse 1999 [electronic catalogue].

Diagnosis

The species is referred to the subgenus *Triaenodes* sensu stricto on the basis that it has an abbreviated basal plate and a pair of processes extending caudad from the basal plate. However, these processes are rather short with club-shaped heads. *Triaenodes africanus* shows similarities to *T. contartus* Jacquemart & Statzner described from the Democratic Republic of the Congo (Jacquemart & Statzner 1981), with respect to these short processes with club-shaped heads, but can easily be separated from this species by the mesal basodorsal process of the inferior appendage, which is club-shaped in *T. africanus* while in *T. contartus* it is triangular to bilobed apically.

Redescription

Male. (n=1). – Forewing length 6.0 mm, hind wing length 4.8 mm. Eye approximately 0.29 mm wide. Antennae broken; scape 0.61 mm long. Maxillary palp segment lengths (in mm) approximately: 0.43, 0.61, 0.60, 0.34, 0.77. Colour reddish-brown.

Male genitalia (figs. 4-7). – Abdominal segment IX with anterior margin broadly rounded, with tergum narrow, pleura setose, projected medially on posterior margin; sternum subtriangular, produced posteriorly, in ventral view with weakly rounded posterior corners and truncately excavated mesally along posterior margin. Preanal appendage long, narrow, setose. Upper part of tergum X apparently absent. Lower part of tergum X long, narrow, pointed, curved ventrad; in dorsal view divided to base, both forks apically curved to the left. Inferior appendage subtriangular, setose; apicomesal lobe subrectangular, broadened distally, with rounded posterior margin and irregular dorsal margin with two, short seta-bearing knobs medially; with strong, spine-like setae mesally; mesal basodorsal process club-shaped, with row of strong, short setae mesally along dorsal and posterior margins; abbreviated basal plate weak, with short, stout, curved spine projecting caudad, with club-shaped, setose apex. Phallus long, curved, with low, dorsolateral flange in basal half and membranous apex.

Remarks

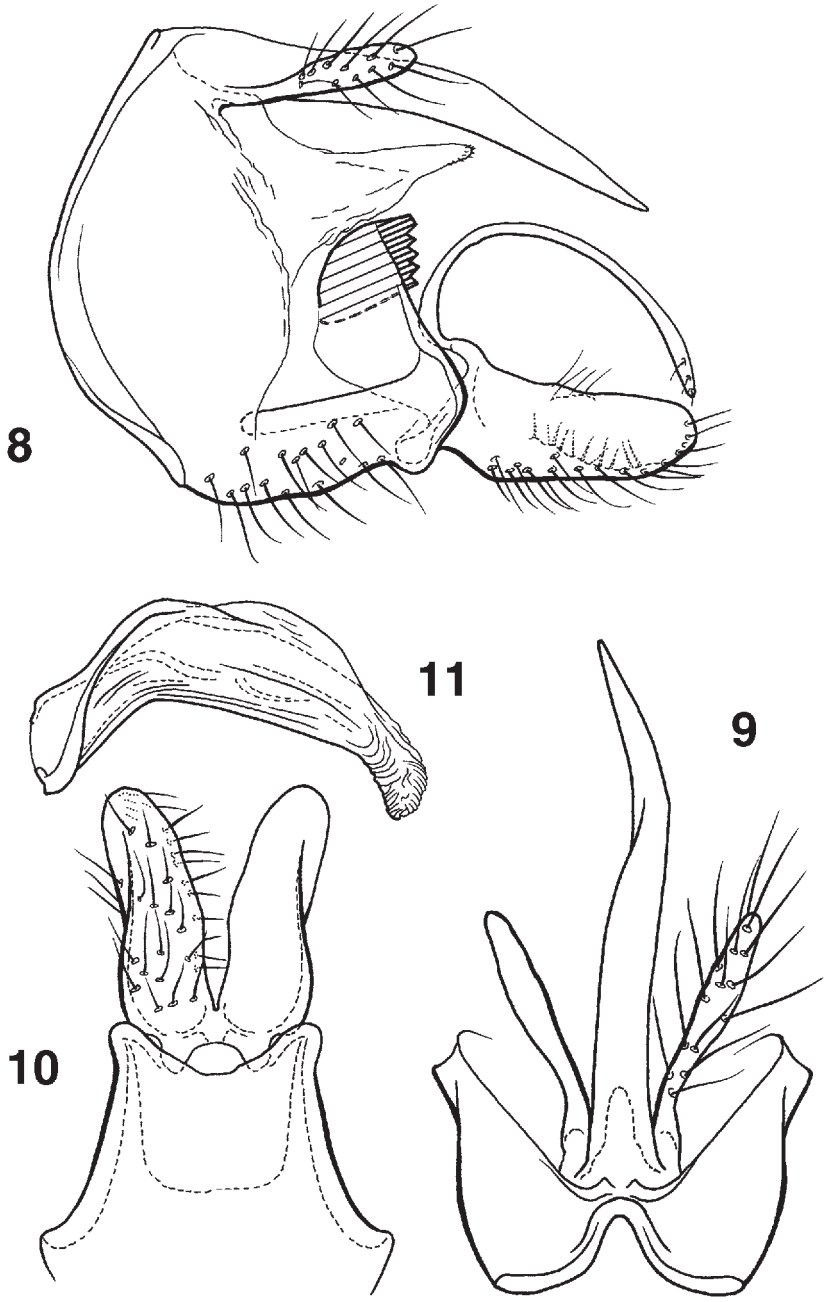
The holotype lacks abdomen and forewings. The redescription is thus based on the specimen from Cameroon, identified to *T. africanus* by Ulmer (1912). The holotype appears, however, to be slightly larger than the specimen from Cameroon, as the hindwings are 5.8 mm long and the scape is 0.69 mm long.

Distribution

The species was described based on a male from Warri, Niger (Ulmer 1907a). Later Ulmer (1912) recorded the species from Cameroon.

Warri is a town in southern Nigeria, and the type locality might be in Nigeria and not in Niger. The original handwritten locality label only says 'W 2 | 8 | 97'. If so, the two specimens will have originated from the same biogeographical subregion.

Material examined. – NIGER: holotype ♂ (pinned on micro-pin), 'W 2 | 8 | 97 [handwritten with pencil on white, stained, unbordered label]; Triaenodes africana Ulmer Type



Figs 8-11. *Triaenodes akua* sp. n., ♂ genitalia. – 8, Lateral; 9, dorsal; 10, ventral; 11, phallus, lateral.

[handwritten on white double-black-bordered label, with red line]; Cat. No 1 [printed / handwritten inside quadrangular double-black-border on white label]; Museum Leiden Triaenodes africana Ulmer Det [printed / handwritten on black-bordered label]; Mus Leiden [underlined, printed on white, partly stippled black-bordered label]' (RMNH). – CAMEROON: ♂ (pinned on micro-pin), 'Kamerun. Bibundi. Tessmann. [handwritten with black ink on blue label with two black lines]; Triaenodes africana Ulm. [handwritten with black ink on white label with black border on three sides]; 120. [handwritten with black ink on white, unbordered label]; Triaenodes africana Ulm. [handwritten with black ink on white, unbordered, folded label]' (ZMHB).

Triaenodes akua sp. n.
(figs. 1, 8-11)

Type material. – Holotype ♂: GHANA: Eastern Region: Boti Waterfalls, 14.xi.1994, at light, NUFU-project (UMSP). – Paratypes: 14♂ same data as holotype; 1♂, Volta Region: Agumatsa Waterfalls, Wli, 7.iii.1993, at light, NUFU-project (USNM, ZMUB, UMSP).

Etymology. – Twi, *akua,* meaning a female born on Wednesday; named in the Ashanti tradition of naming children after the day they are born, signifying that the species description was written on a Wednesday; the name is a noun in apposition.

Diagnosis

The species groups with *T. elegantulus* Ulmer, *T. tofanus* Gibbs, and *T. troubati* Gibon in the general shape of the inferior appendage. However, the combination of narrowly ovate preanal appendages; broad, spine-like, weakly curved upper part of tergum X; and triangular, membranous lower part of tergum X separates the species from the other three.

Description

Male (n=10). – Forewing length 6.7-7.4, 6.9 mm; hind wing length 5.0-6.0, 5.3 mm. Eye 0.37-0.42, 0.39 mm wide. Antenna at least 18.9 mm long, including 0.74-0.87, 0.79 mm long scape; scape with scent organ (fig. 1). Maxillary palp segment lengths (in mm): 0.53-0.60, 0.57; 0.56-0.63, 0.59; 0.55-0.60, 0.57; 0.34-0.40, 0.37; 0.74-0.82, 0.80. Colour in alcohol unicolourous reddish-brown.

Male genitalia (figs. 8-11). – Abdominal segment IX with broadly rounded anterior margin; tergum narrow; pleural region broadly rounded, posterior margin membranous; sternum subtriangular, produced posteriad. Preanal appendage narrowly ovate, setose. Upper part of tergum X strongly sclerotized, broad spine, slightly curved ventrad; in dorsal view slightly sinuous, apex projecting to the right. Lower part of tergum X triangular, membranous, with short setae apically. Inferior appendage subrectangular, broadly rounded apically, setose; mesally with ridge with long setae, mid-dorsally with few setae on weak elevation; abbreviated basal plate small, projecting anterodorsad, with curved process extending caudad, weakly club-shaped subapically, apex with few setae. Phallus strong, curved, with dorsal, asymmetrical flanges and trough-like, membranous apex.

Distribution and habitat

The species was taken in light traps at two small rather fast flowing rivers in the southeastern forested part of Ghana.

Triaenodes darfuricus Mosely
(figs. 2, 12-16)

Triaenodes darfuricus Mosely, 1936: 434, figs. 10-14. Type locality: SUDAN: W. Darfur: Jebel Murra, Killing; BMNH; ♂.
Adicella darfuricus (Mosely). – Kimmins 1956: 146 [list]; Fischer 1972: 79 [catalogue].
Triaenodes darfuricus Mosely. – Kimmins 1961: 242, fig. 1; Fischer 1965: 94 [catalogue]; Dakki 1980: 42; Malicky 1983: 269 [atlas]; Kjærandsen & Andersen 1997: 247 [list]; Morse 1999 [electronic catalogue].
Triaenodes bernardi Vaillant, 1953: 153-155, figs. 22-39. – Ulmer 1955: 501 [as synonym].
Triaenodes bernardi Vaillant. – Jacquemart 1966: 40-41, fig. 5; Fischer 1972: 69 [catalogue].

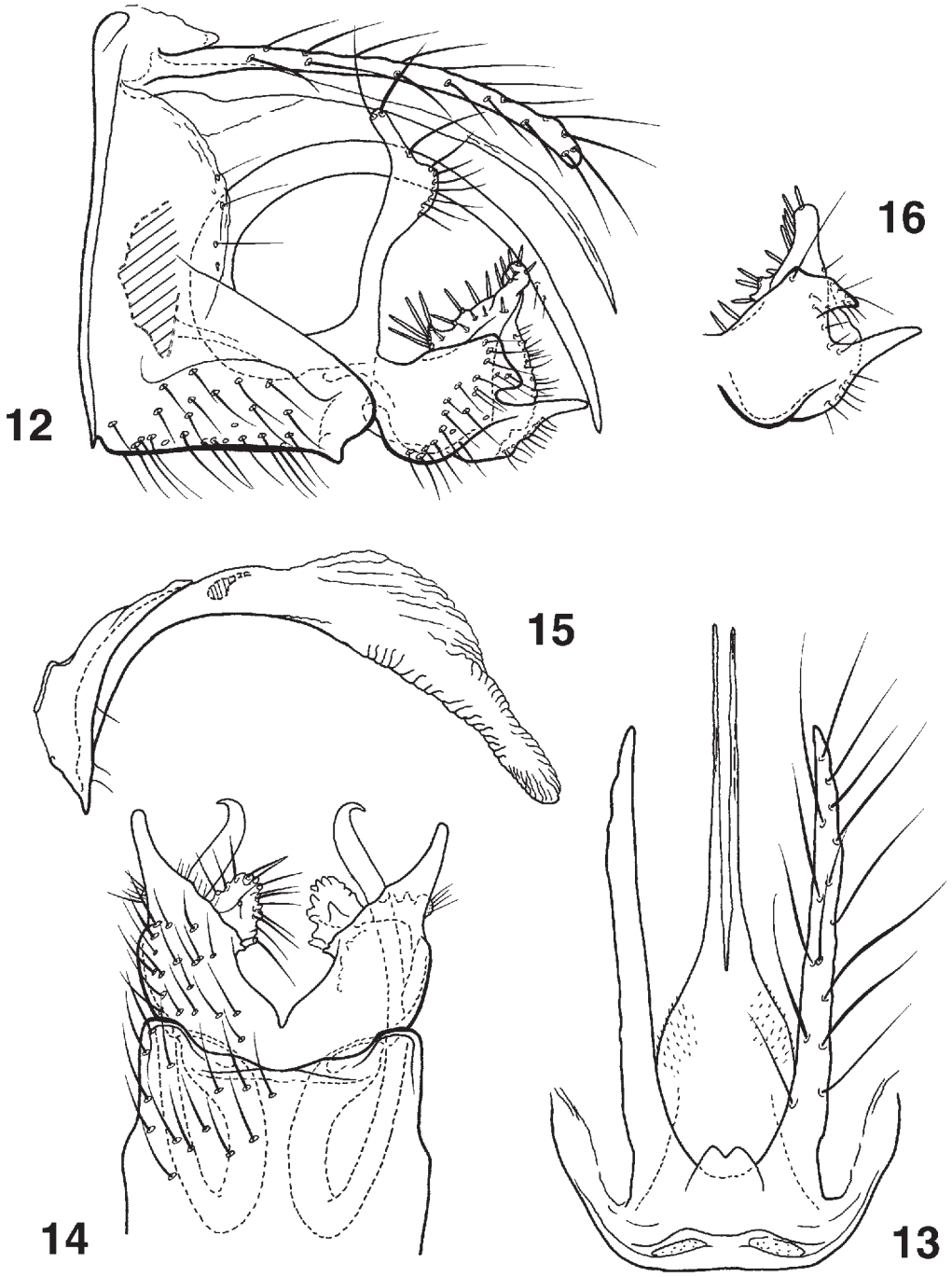
Diagnosis

The species shows some similarities with *T. aureus* Jacquemart & Statzner described from the Democratic Republic of the Congo (Jacquemart & Statzner 1981), in the shape of the stout, curved processes extending caudad from the basal plate and the narrow mesal basodorsal lobe of the inferior appendage. However, while *T. aureus* appears to have a rather parallel-sided mesal basodorsal lobe, *T. darfuricus* has a lobe which is enlarged subapically. There are also apparent differences in the shape of the inferior appendage, which is subtriangular in *T. aureus* and in the shape of the apicomesal lobe, which is more narrowly triangular in *T. aureus.*

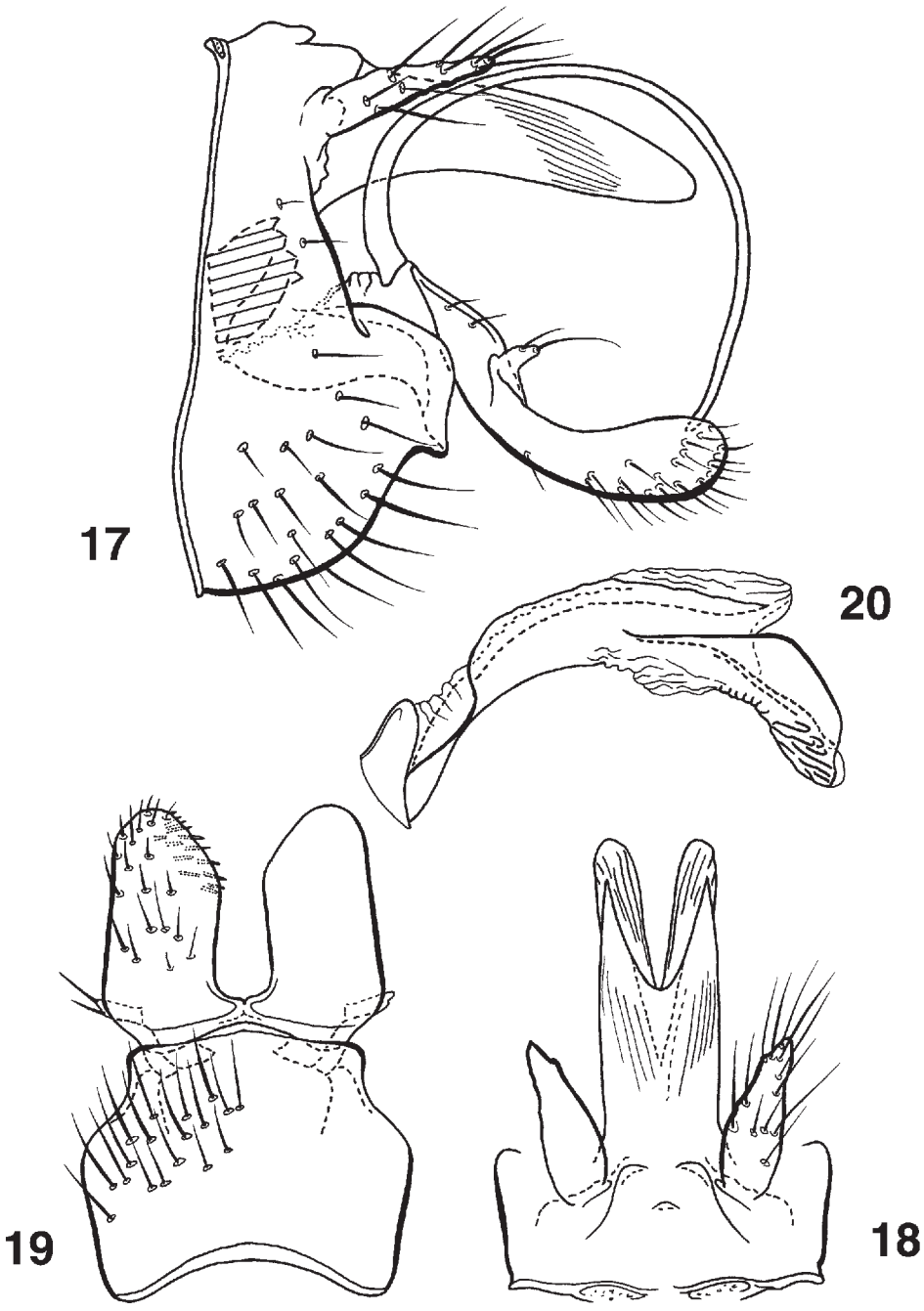
Redescription

Male (n=10). – Forewing length 6.3-7.3, 6.9 mm; hind wing length 4.9-5.6, 5.4 mm. Eye 0.37-0.46, 0.42 mm wide. Antenna at least 18.3 mm long, including 0.49-0.58, 0.53 mm long scape; scape with scent organ (fig. 2). Maxillary palp segment lengths (in mm): 0.40-0.51, 0.48; 0.48-0.58, 0.53; 0.53-0.63, 0.59; 0.37-0.40, 0.39; 0.66-0.82, 0.75. Colour in alcohol overall reddish-brown.

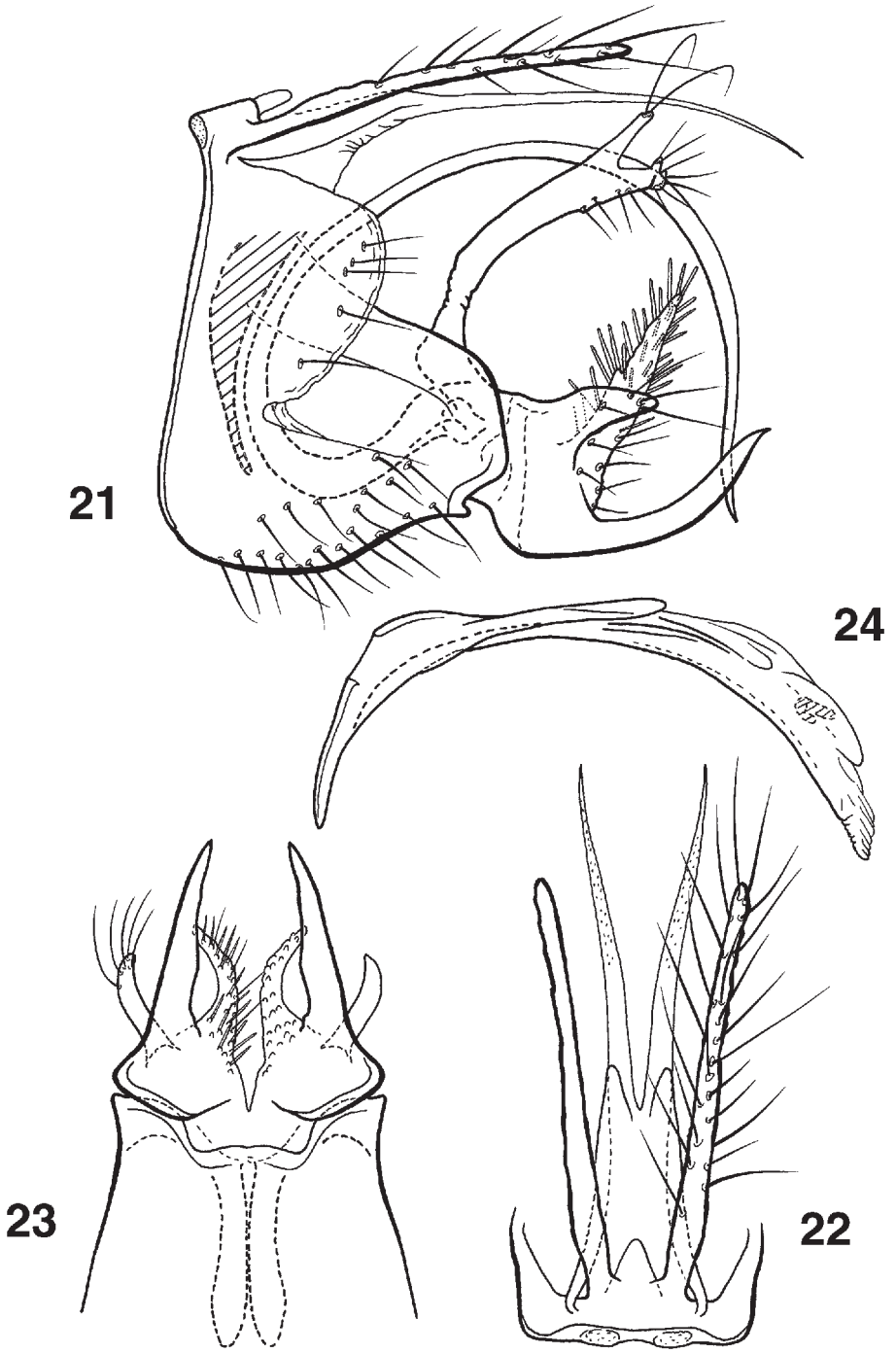
Male genitalia (figs. 12-15). – Abdominal segment IX with anterior margin straight, tergum narrow; pleural region broadly rounded, posterior margin with few setae; sternum triangular, strongly produced posteriorly, in ventral view with slightly concave apical



Figs 12-16. *Triaenodes darfuricus* Mosely, ♂ genitalia. – 12, Lateral; 13, dorsal; 14, ventral; 15, phallus, lateral; 16, apex of inferior appendage, lateral [Holotype].



Figs 17-20. *Triaenodes elegantulus* Ulmer, ♂ genitalia. – 17, Lateral; 18, dorsal; 19, ventral; 20, phallus, lateral.



Figs 21-24. *Triaenodes imakus* Gibbs, ♂ genitalia. – 21, Lateral; 22, dorsal; 23, ventral; 24, phallus, lateral.

margin. Preanal appendage long, narrow, setose. Upper part of tergum X short, bilobed, membranous. Lower part of tergum X narrow especially apically, semi-membranous, curved ventrally; in dorsal view with broad, weakly setose base, distally digitate. Inferior appendage strong, subquadrangular, with posteroventral corner produced in triangular, acute projection pointing caudad; apicomesal lobe irregularly triangular, rugose, with strong, spine-like setae mesally; mesal basodorsal process slightly sinuous, enlarged subapically with few long setae along posterior margin, apically bluntly rounded, with two long setae; abbreviated basal plate projecting anteriad, with strongly curved, acute process extending caudad. Phallus slender, curved, with distal one half membranous.

Remarks

The species was transferred to *Adicella* by Kimmins (1956) based on wing venation, i.e. the type specimen having the stem of M complete. With more material at his disposal, Kimmins (1961) returned the species to *Triaenodes,* as he considered the well-developed stem of M in the type specimen as a probable aberration.

The holotype from Sudan shows some slight variation from the specimens from Ghana in the shape of the inferior appendage (fig. 16).

Distribution and habitat

The species was described from a male from the Jebel Marra mountains in western Sudan (Mosely 1936). Kimmins (1961) recorded the species from Niokolo-Koba National Park in Senegal and Jacquemart (1966) listed it from Garamba National Park in the Democratic Republic of the Congo. The species is also found in the Palaearctic biogeographical region in Tassili-n-Ajjer in Algeria (Vaillant 1953). Kjærandsen & Andersen (1997) recorded it from the Volta and Eastern Regions of Ghana, and the present paper adds more records from Ghana and Ivory Coast.

A record of a *Triaenodes* sp. near *T. darfuricus* from the Mpanga Forest in Uganda (Corbet 1961) is most probably referable to *T. uncatus* Kimmins (see Kimmins 1962).

Vaillant (1953) found the larvae to be relatively abundant in a 30 cm wide spring-fed stream in the oasis de Djanet in the Tassili-n-Ajjer National Park in Central Sahara. The oasis is situated at 1080 m altitude and the water temperature in the stream in late May was 20°C at 17 hrs. Vaillant (1953) described the larva and stated that it was crawling on the bottom, lacking the ability to swim. In Ghana the species has been taken in light traps close to moderately to fast flowing streams and medium-sized to large rivers in the northern part of the country and also at streams and small rivers in the southeastern, forested part.

Material examined. – GHANA: Volta Region: Agumatsa Waterfalls, Wli, 85♂, 16-19.xi.1993, at light, NUFU-project; Volta Region: River Hule (Nubui) S of Fodome Xelu, 3♂, 7.xi.1995, at light, NUFU-project; Volta Region: Togabe Falls, Woti, 4♂, 9.xi.1995, at light, NUFU-project; Northern Region: Mole National Park, Mole River, 20♂, 16.xi.1996, at light, NUFU-project; Northern Region: White Volta at Daboya, 7♂, 21.xi.1996, at light, NUFU-project; Upper West Region: Black Volta at Dabo, 9♂, 18.xi.1996, at light, NUFU-project. – IVORY COAST: 25 km N Bouake, 1♂, 27-30.x.1971, black light trap, J. A. Gruwell (USNM). – SENEGAL: Parc National des Niokolo-Koba, Bodi, 1♂, 9.ix.1955, lampe UV (BMNH). – SUDAN: W. Darfur, Jebel Murra, Killing, 7000 ft., holotype ♂, 7.iv.1932, M. Steele (BMNH).

Triaenodes elegantulus Ulmer
(figs. 17-20)

Triaenodes elegantulus Ulmer, 1908: 6-7, figs. 18-19. Type locality: DEUTSCH OST-AFRIKA [TANZANIA]: Usambara, Mombo; NHRS; ♂.

Triaenodes elegantulus Ulmer. – Ulmer 1909: 362 [list]; Ulmer 1912: 110; Ulmer 1913: 191; Lestage 1919: 317, 329 [list]; Mosely 1932b: 133 [list]; Barnard 1934: 331, fig. 20a-e; Lestage 1936: 178 [list]; Kimmins 1956: 144 [list]; Jacquemart 1959: 111, 113, fig. 1; Kimmins 1959: 53, 56; Jacquemart 1963: 356, fig. 16; Kimmins 1963: 144-145, 169; Marlier 1965: 24; Fischer 1965: 72 [catalogue]; Fischer 1972: 95 [catalogue]; Johanson 1992: 134 [catalogue]; de Moor 1993: 55 [list]; Morse 1999 [electronic catalogue].

Diagnosis

The species groups with *T. akua* sp. n., *T. tofanus* Gibbs and *T. troubati* Gibon in the general shape of the inferior appendage. However, the reduced upper part of tergum X separates the species from the other three.

Redescription

Male (n=1-2). – Forewing length 6.9-7.1 mm, hind wing length 5.0-5.4 mm. Eye 0.39-4.0 mm wide. Antenna at least 14.1 mm long, including 0.50-0.52 mm long scape. Maxillary palp segment lengths (in mm): 0.45, 0.47, 0.50, 0.34, 0.71. Colour in alcohol yellowish-brown.

Male genitalia (figs. 17-20). – Abdominal segment IX with anterior margin nearly straight, weakly rounded ventrally; tergum comparatively wide; pleural region with posterior margin straight; sternum subquadrangular, with rounded ventral margin; in ventral view with rounded corners, and weakly convex posterior margin. Preanal appendage, short, narrowly rectangular, setose. Upper part of tergum X lacking. Lower part of tergum X triangular with rounded apex, semimembranous; in dorsal view with V-shaped incision in apical one third. Inferior appendage narrow basally, wider apically with rounded posterior margin, curved posteroventrad; abbreviated basal plate projecting anterodorsad, with strongly curved spine extending cau-

dad. Phallus cylindrical, curved; with weak dorsolateral flanges; with membranous swelling dorsomedially; phallotremal sclerite indistinct.

Distribution and habitat

Ulmer (1908) described the species from the West Usambara Mountains in the Tanga Region in Tanzania. Later he gave a new record from the Singida Region in Tanzania (Ulmer 1912). Ulmer (1913) also recorded the species from South Africa; further records from South Africa were given by Barnard (1934) and Jacquemart (1963). According to de Moor (1993) the species has been taken in three regions in the eastern parts of South Africa. Further, Kimmins (1959) recorded the species from the Ruwenzori Range in Uganda, Jacquemart (1959) from Lake Albert in the Oriental Region in the Democratic Republic of the Congo, and Marlier (1965) from the Benguela Region in Angola.

Kimmins (1963) mentioned a specimen of a *Triaenodes* species near *T. elegantulus* Ulmer from Ethiopia, and stated that it probably belongs to a new species as it differs from *T. elegantulus* in certain details in the male genitalia.

The present paper adds records from the Northern Region of Ghana, Victoria Falls National Park in Zimbabwe and the Morogoro Region in Tanzania. In Ghana the species was taken at light close to a medium sized, moderately fast flowing river in the northern part of the country.

Material examined. – GHANA: Northern Region: Mole National Park, Mole River, 2♂, 16.xi.1996, at light, NUFU-project. – TANZANIA: Morogoro Region, Morogoro, 1♂, i-v.1992, L. Aarvik. – ZIMBABWE (RHODESIA): Victoria Falls National Park, 1♂, 3-6.iv.1968, P. Spangler (USNM).

Triaenodes imakus Gibbs
(figs. 21-24)

Triaenodes imakus Gibbs, 1973: 400, figs. 113-115. Type locality: GHANA: Eastern Region, Tafo; BMNH; ♂.
Triaenodes imakus Gibbs. – Kjærandsen & Andersen 1997: 247 [list]; Morse 1999 [electronic catalogue].

Diagnosis

The species shows similarities to *T. clarus* Jacquemart described from the Democratic Republic of the Congo (Jacquemart 1961), but can easily be distinguished by the stout inferior appendage with two strong, pointed projections distally, and by the long, curved mesal basodorsal process which is shallowly forked.

Redescription

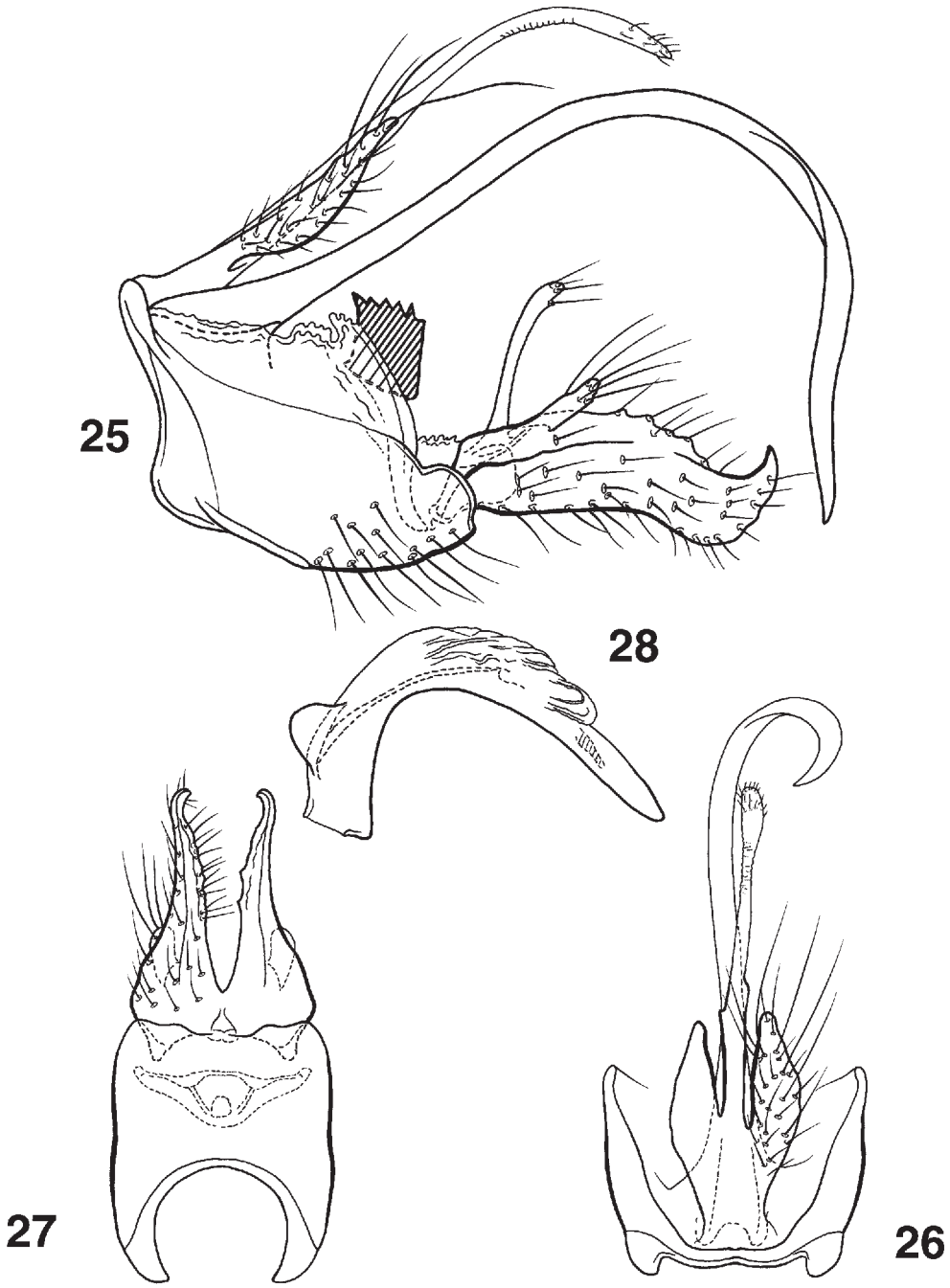
Male (n= 6-7). – Forewing length 6.2-6.8, 6.5 mm; hind wing length 4.6-5.1, 4.9 mm. Eye 0.36-0.42, 0.39 mm wide. Antenna at least 18.8 mm long, including 0.52-0.57, 0.54 mm long scape. Maxillary palp segment lengths (in mm): 0.46-0.49, 0.47; 0.51-0.55, 0.54; 0.51-0.61, 0.56; 0.36-0.39, 0.37; 0.72-0.80, 0.76. Colour in alcohol overall reddish-brown.

Male genitalia (figs. 21-24). – Abdominal segment IX with anterior margin straight and broadly rounded anteroventral corner; tergum narrow; pleural region broadly rounded, membranous, setose; sternum subrectangular, produced posteriad; in ventral view apical margin with prominent, subtriangular corners and quadrangular excision medially. Preanal appendage long, narrow, setose. Upper part of tergum X a short, rounded lobe. Lower part of tergum X divided, long, very narrow, weakly curved ventrally; in dorsal view base narrowly triangular, with low dorsolateral flange; distal three fifths forming two very narrow, semi-membranous, pointed projections, with very fine setae on distal half. Inferior appendage stout, with two strong, pointed projections distally; ventral projection narrow, in lateral view curved posterodorsad, in ventral view straight; dorsal projection short, triangular, in lateral view straight, in ventral view curved posterolaterad; apicomesal lobe narrowly triangular, rugose, with strong setae mesally; mesal basodorsal process prominent, curved caudad, semi-membranous just above base, forked subapically; ventral process triangular with apex irregularly lobed, setose; dorsal process tapering, with two strong, curved setae apically; abbreviated basal plate stout, projecting anteroventrad, with long, strongly curved spine-like process projecting caudad. Phallus very slender, curved, trough-shaped subapically, with narrow, lateral flanges, and small, u-shaped phallotremal sclerite subapically.

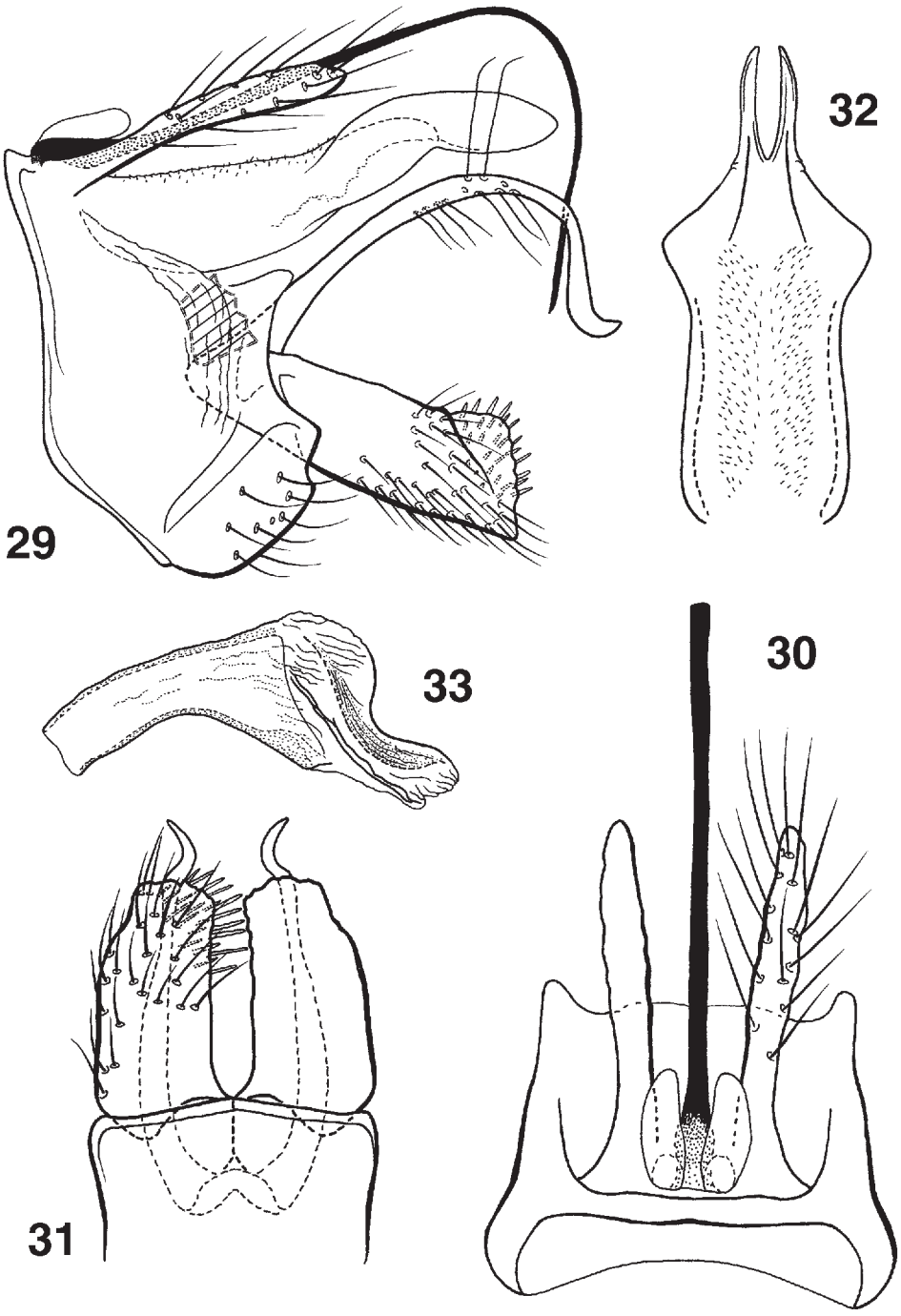
Distribution and habitat

Gibbs (1973) recorded the species from the Volta and Eastern Regions in Ghana; Kjærandsen & Andersen (1997) added records from the Central and Greater Accra Regions. The species was taken in light traps close to slowly flowing to moderately fast flowing streams and small rivers in the southcentral and southeastern parts of the country.

Material examined. – GHANA: Volta Region: Agumatsa Waterfalls, Wli, 1♂, 4-13.iii.1993, Malaise trap, NUFU-project; Volta Region: Agumatsa Waterfalls, Wli, 1♂, 7.iii.1993, at light, NUFU-project; Volta Region: Agumatsa Waterfalls, Wli, 1♂, 16.xi.1993, at light, NUFU-project; Volta Region: River Uwue South of Lipke Mate, 1♂, 6.xi.1995, at light, NUFU-project; Eastern Region: Boti Falls, 8♂, 14.xi.1994, at light, NUFU-project; Eastern Region: Taben by Kade to Asoum Road, 3♂, 25.xi.1995, at light, NUFU-project.



Figs 25-28. *Triaenodes kofi* sp. n., ♂ genitalia. – 25, Lateral; 26, dorsal; 27, ventral; 28, phallus, lateral.



Figs 29-33. *Triaenodes kwabena* sp. n., ♂ genitalia. – 29, Lateral; 30, dorsal; 31, ventral; 32, lower part of tergite X, dorsal; 33, phallus, lateral.

Triaenodes kofi sp. n.
(figs. 25-28)

Type material. – Holotype ♂: Ghana: Western Region: Ankasa Game Production Reserve, 16.xi.1995, at light, NUFU-project, (UMSP). – Paratypes: 4♂ same-data as holotype except 9.xii.1993; 1♂ same data as holotype except 8.xii.1993 (USNM, ZMUB, UMSP).

Etymology. – Twi, *kofi,* meaning a male born on Friday; named in the Ashanti tradition of naming children after the day they are born, signifying that the species description was written on a Friday; the name is a noun in apposition.

Diagnosis

The new species shows similarities to *T. cheliferus* (Mosely) described from Uganda, *T. clavatus* (Mosely) described from Tanzania (Mosely 1932a), *T. polystachius* (Marlier) described from the Democratic Republic of the Congo (Marlier 1957), and *T. moselyi* Kimmins described from Uganda (Kimmins 1962), in having a long, tubular upper part of tergum X with club-shaped, setose apex. However, all these species appear to have long, narrow preanal appendages, while *T. kofi* sp. n. has shorter, triangular preanal appendages. Further, *T. moselyi* is the only one of these species that appears to have the lower part of tergum X forming a long, narrow, curved spine, resembling that in *T. kofi* sp. n. However, the shape of the inferior appendage of *T. kofi* sp. n. with the basal two thirds subrectangular, subapically sinuous and with apex hooked dorsad, easily separates the species from *T. moselyi* and apparently also from all the other species mentioned above.

Description

Male (n=6). – Forewing length 5.4-5.8, 5.6 mm; hind wing length 3.9-4.3, 41 mm. Eye 0.31-0.34, 0.32 mm wide. Antenna at least 17.9 mm long, including 0.45-0.59, 0.54 mm long scape. Maxillary palp segment lengths (in mm): 0.37-0.50, 0.41; 0.50-0.56, 0.53; 0.47-0.56, 0.52; 0.31-0.37, 0.35; 0.55-0.58, 0.56. Colour in alcohol overall reddish-brown.

Male genitalia (figs. 25-28). – Abdominal segment IX with anterior margin slightly concave and broadly rounded anteroventral corner; with tergum and pleura narrow; sternum subrectangular, strongly produced posteriorly; in ventral view with posterior margin nearly straight. Preanal appendage triangular, apparently fused to upper part of tergum X. Upper part of tergum X long, tubular, slightly curved ventrad subapically, with club-shaped, setose apex. Lower part of tergum X long, narrow, spine, distal half curved ventrad; in dorsal view asymmetrical, with apex curved to the left. Inferior appendage with basal two thirds subrectangular, subapically sinuous with apex hooked dorsad; lateral basodorsal process short, digitate, setose; abbreviated basal plate weak with short, slightly recurved process, with few setae apically. Phallus narrow, tubular, strongly curved, with small, rounded, symmetrical flanges subbasally, larger, membranous, slightly asymmetrical flanges dorsomedially, and narrowly rounded apex.

Distribution and habitat

The species was taken at light at a small moderately fast flowing river in the humid coastal forests in southwest Ghana.

Triaenodes kwabena sp. n.
(figs. 3, 29-33)

Type material. – Holotype ♂: Ghana: Volta Region: Agumatsa Waterfalls, Wli, 16.iii.1993, at light, NUFU-project (UMSP). – Paratypes: 35♂ same data as holotype except 7-8.iii.1993; 6♂ same data as holotype except 16-19.xi.1993; 1♂, Volta Region: River Hule (Nubui) south of Fodome Xelu, 7.xi.1995, at light, NUFU-project (USNM, ZMUB, UMSP).

Etymology. – Twi, *kwabena,* meaning a male born on Tuesday; named in the Ashanti tradition of naming children after the day they are born, signifying that the species description was written on a Tuesday; the name is a noun in apposition.

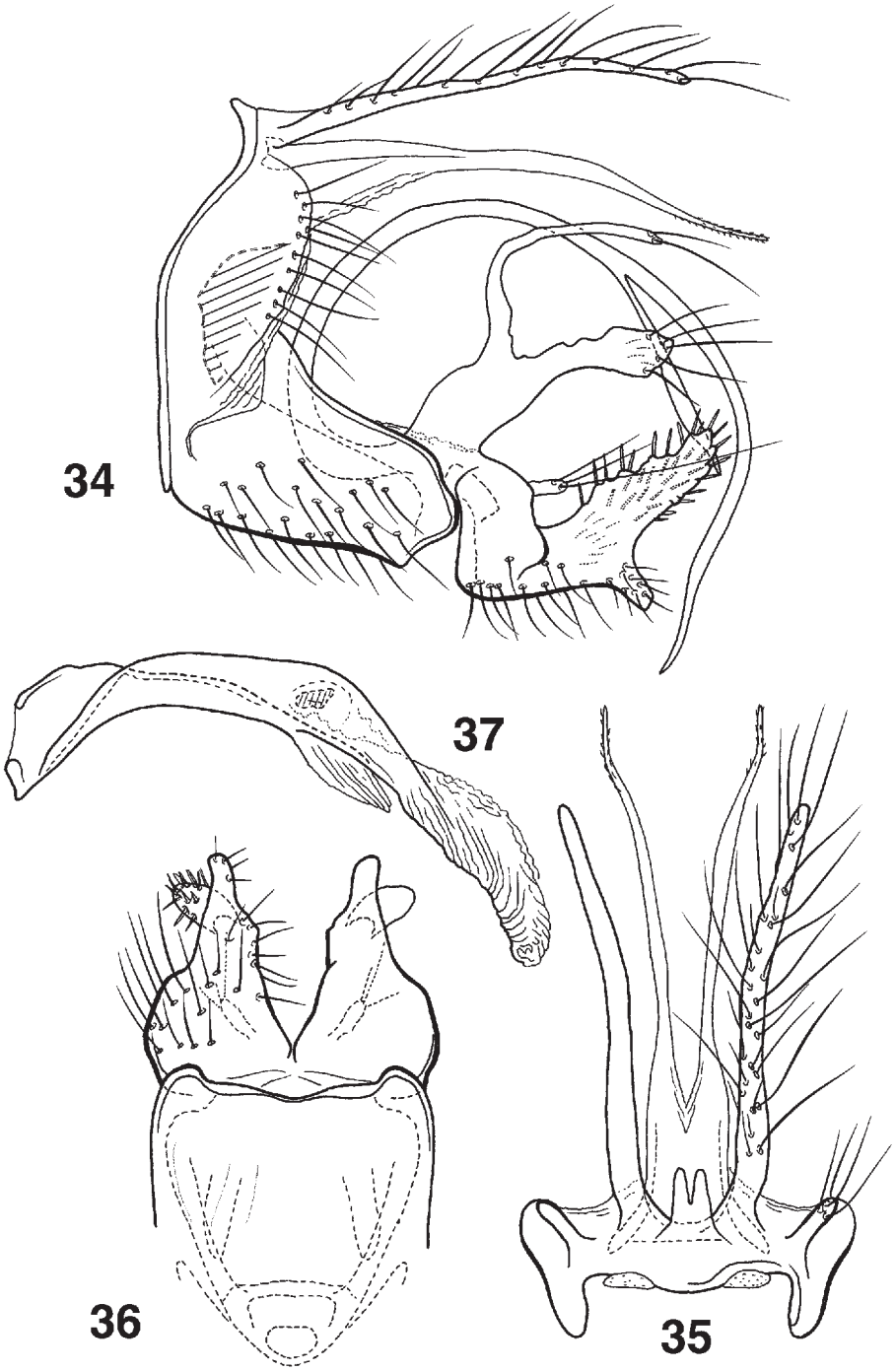
Diagnosis

The species is easily separated from other Afrotropical *Triaenodes* species by the subrectangular inferior appendages, and the form of the lower part of tergum X which is broad and sinuous in lateral view, with triangular corners at two third length and deeply split apex in dorsal view.

Description

Male (n=10). – Forewing length 6.8-7.7, 7.3 mm; hind wing length 5.2-6.0, 5.6 mm. Eye 0.43-0.48, 0.46 mm wide. Antenna at least 21.9 mm long, including 0.82-0.90, 0.87 mm long scape; scape with scent organ (fig. 3). Maxillary palp segment lengths (in mm): 0.52-0.60, 0.57; 0.63-0.71, 0.68; 0.58-0.71, 0.64; 0.37-0.43, 0.40; 0.74-0.84, 0.77. Colour in alcohol overall dark reddish-brown.

Male genitalia (figs. 29-33). – Abdominal segment IX with anterior margin weakly rounded; tergum narrow; pleural region rounded, membranous; sternum subrectangular, in ventral view with apical margin straight. Preanal appendage digitate, setose. Upper part of tergum X long, narrow, acute spine; medially strongly curved ventrad, with pair of short, rounded lobes basolaterally. Lower part of tergum X broad, sinuous, basodorsally membranous, with weak setae; api-



Figs 34-37. *Triaenodes kwaku* sp. n., ♂ genitalia. – 34, Lateral; 35, dorsal; 36, ventral; 37, phallus, lateral.

cally broadly rounded; in dorsal view with triangular corners at two thirds length and deeply split apex. Inferior appendage subrectangular, setose, projecting posteroventrad, posterodorsal corner rounded, with short, spine-like setae apicomesally; abbreviated basal plate projecting posterodorsad, with spine-like recurved process extending caudad, setose medially, curved ventrally, subapically sinuous. Phallus tubular basally, slightly curved, broadly rounded distally, apex with paired lobes extending posteroventrad.

Distribution and habitat

The species was taken in light traps close to small rather fast flowing rivers in the southeastern forested parts of Ghana.

Triaenodes kwaku sp. n.
(figs. 34-37)

Type material. – Holotype ♂: Ghana: Volta Region: Agumatsa Waterfalls, Wli, 6-15.iii.1993, Malaise trap, NUFU-project (UMSP). – Paratypes: 1♂ same data as holotype except 11.iii.1993, at light; 2♂, Volta Region: Tagobe Falls, Woti, 9.xi.1995, at light, NUFU-project (USNM, ZMUB).

Etymology. – Twi, *kwaku,* meaning a male born on Wednesday; named in the Ashanti tradition of naming children after the day they are born, signifying that the species description was written on a Wednesday; the name is a noun in apposition.

Diagnosis

The recurved processes of the abbreviated basal plates are forked medially, with ventral projections lanceolate and dorsal projections long and narrow, which apparently render the species distinct among Afrotropical *Triaenodes* species.

Description

Male (n=1-2). – Forewing length 5.8-6.2 mm; hind wing length 4.4-5.0 mm. Eye 0.35-0.39 mm wide. Antenna at least 16.4 mm long, including 0.47-0.52 mm long scape. Maxillary palp segment lengths (in mm): 0.45, 0.60, 0.63, 0.42, 0.77. Colour in alcohol overall reddish-brown.

Male genitalia (figs. 34-37). – Abdominal segment IX with anterior margin slightly rounded; tergum narrow; pleural region rounded, setose, widest dorsally; sternum, subrectangular, strongly produced posteriorly, in ventral view with rounded corners, shallowly excavated with nearly straight apical margin. Preanal appendage long, very narrow, setose. Upper part of tergum X short, bilobed. Lower part of tergum X narrow, slightly sinuous, with fine setae subapically; in dorsal view forked almost to base, the forks very narrow, weakly sinuous. Inferior appendage short, subrectangular; apicomesal lobe bilobed, with short, tooth-like lobe posteroventrally and triangular, rugose, strongly setose lobe posterodorsally; lateral basodorsal lobe prominent, with broad base, forked medially, ventral projection irregular, broadly rounded, with long, apical setae, dorsal projection narrow, curved, with two strong apical setae; abbreviated basal plate projecting anteroventrad, with long, spine-like recurved process projecting caudad, forked medially, ventral projection lanceolate, dorsal projection long, narrow, curved, with few short setae subapically. Phallus slender, curved; with symmetrical, dorsolateral flanges; membranous apically; phallotremal sclerite u-shaped.

Distribution and habitat

The species was taken in light traps close to small, rather fast flowing rivers in the southeastern, forested parts of Ghana.

Triaenodes kwame sp. n.
(figs. 38-41)

Type material. – Holotype ♂: Ghana: Western Region: Ankasa Game Production Reserve, 8.xii.1993, at light, NUFU-project (UMSP).

Etymology. – Twi, *kwame,* meaning a male born on Saturday; named in the Ashanti tradition of naming children after the day they are born, signifying that the species description was written on a Saturday; the name is a noun in apposition.

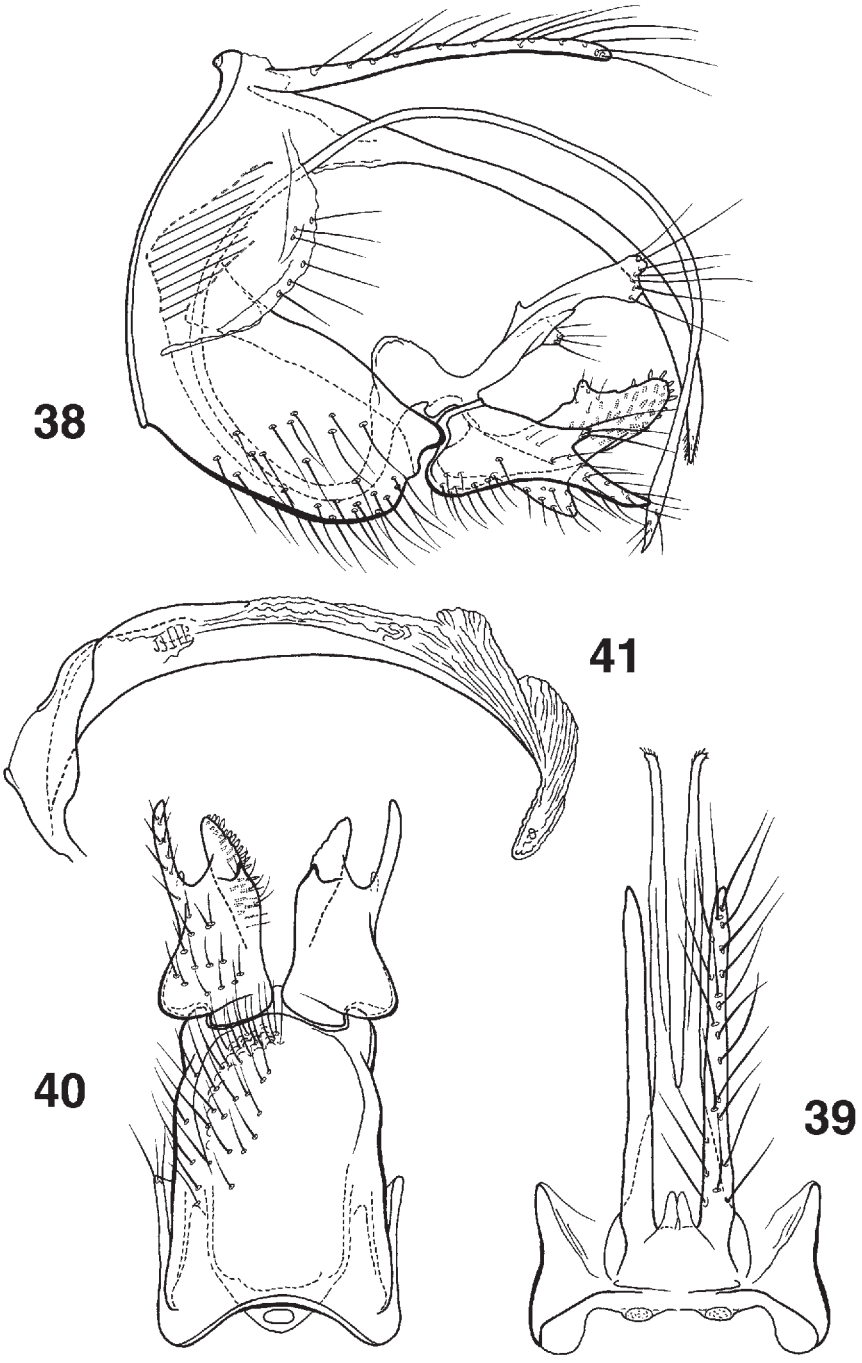
Diagnosis

The recurved processes of the abbreviated basal plates are very long and thin, slightly expanded towards apex and setose apex, which render the species distinct from other Afrotropical *Trianenodes* species.

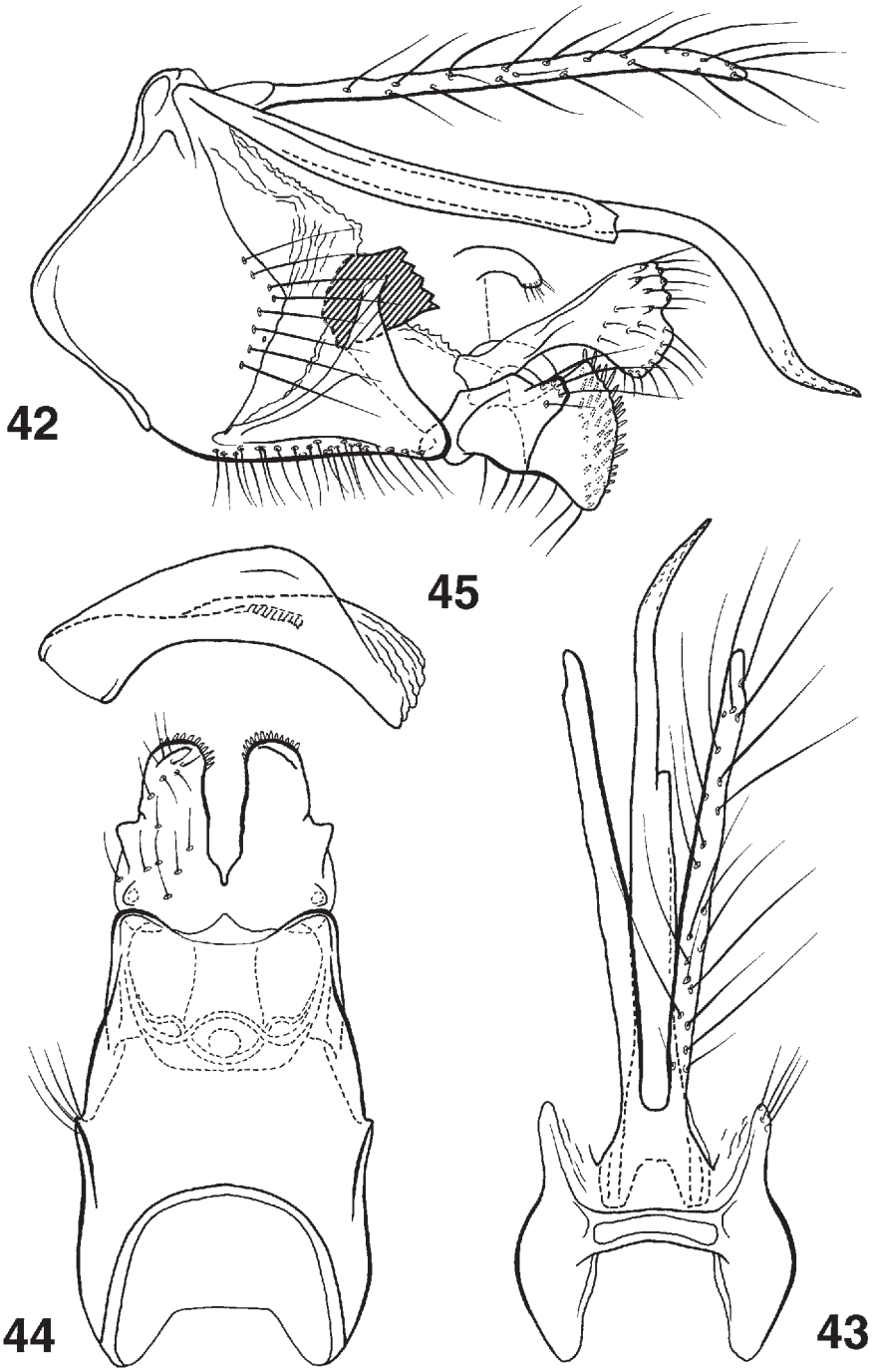
Description

Male (n=1). – Forewing length 6.3 mm; hind wing length 4.9 mm. Eye 0.39 mm wide. Antenna at least 19.2 mm long, including 0.69 mm long scape. Maxillary palp segment lengths (in mm): 0.48, 0.55, 0.58, 0.40, 0.79. Colour in alcohol overall light yellowish-brown.

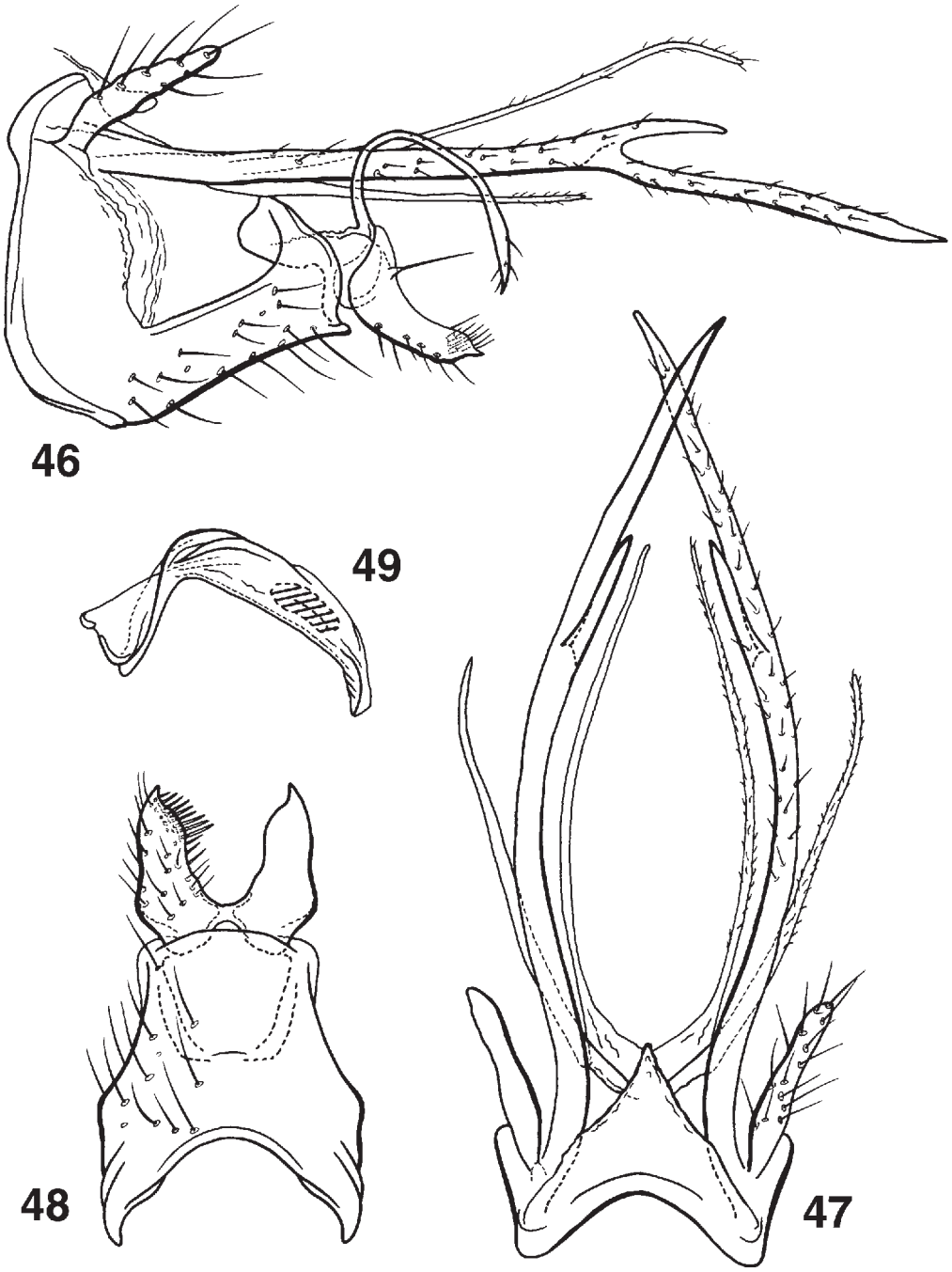
Male genitalia (figs. 38-41). – Abdominal segment IX with slightly rounded anterior margin; tergum narrow; pleural region broadly rounded, posterior margin membranous, setose; sternum subrectangular, strongly produced posteriorly; in ventral view with broadly rounded posterior margin and protruding, rounded corners. Preanal appendage long, narrow, setose. Upper part of tergum X in form of paired, short, digitate lobes. Lower part of tergum X in form of a pair of strong spines, curved ventrad, apex finely setose. Infe-



Figs 38-41. *Triaenodes kwame* sp. n., ♂ genitalia. – 38, Lateral; 39, dorsal; 40, ventral; 41, phallus, lateral.



Figs 42-45. *Triaenodes kwasi* sp. n., ♂ genitalia. – 42, Lateral (insect – detail of recurved process); 43, dorsal; 44, ventral; 45, phallus, lateral.



Figs 46-49. *Triaenodes scottae* Gibon, ♂ genitalia. – 46, Lateral; 47, dorsal; 48, ventral; 49, phallus, lateral.

rior appendage with apicomesal lobe bilobed, with irregularly rounded dorsal lobe, with short, spine-like setae mesally, and triangular, setose ventral lobe; basodorsal lobe short, setose; mesal basodorsal lobe slightly sinusoid, with short, irregular, setose lobes medially and shallowly bilobed, setose apex; abbreviated basal plate strong, projecting anteriad, with thin, recurved process extending caudad, with lanceolate, setose apex. Phallus long, slender, curved subapically, distal one quater semi-membranous; with low, symmetrical flanges subbasally; with distinct u-shaped phallotremal sclerite.

Distribution and habitat

The single specimen was taken at light at a small moderately fast flowing river in the humid coastal forests in southwest Ghana.

Triaenodes kwasi sp. n.
(figs. 42-45)

Type material. – Holotype ♂: Ghana: Central Region: Kakum Forest Reserve, 8-15.xi.1994, Malaise trap, NUFU-project (UMSP).

Etymology. – Twi, *kwasi,* meaning a male born on Sunday; named in the Ashanti tradition of naming children after the day they are born, signifying that the species description was written on a Sunday; the name is a noun in apposition.

Diagnosis

The species is here referred to the subgenus *Triaenodes* sensu stricto, as it has an abbreviated basal plate and a pair of recurved processes extending caudad from the basal plate. However, these processes are very short with bluntly rounded apices. The species shows similarities to *T. africanus* Ulmer and *T. contartus* Jacquemart & Statzner, but can be easily separated from these on the shape of the lower part of tergum X, which is sinuous and projecting caudad in *T. kwasi* sp. n., while curved and projecting ventrad in the former two.

Description

Male (n=1). – Forewing length 5.1 mm; hind wing length 4.0 mm. Eye 0.34 mm wide. Antenna broken, scape 0.37 mm. Maxillary palp segment lengths (in mm): 0.37, 0.54, 0.58, 0.40. 0.72. Colour in alcohol uniformly light yellowish-brown.

Male genitalia (figs. 42-45). – Abdominal segment IX with anterior margin subtriangular, rounded; tergum narrow; pleural region triangular, semi-membranous, posterior margin setose; sternum triangular, produced posteriorly; in ventral view with rounded posterior corners. Preanal appendage long, narrow, setose. Upper part of tergum X reduced. Lower part of tergum X a strong spine, split at two third length, left spine broken [one single specimen known], right spine curved ventrad, sinuous, projecting caudad, subapically with shallow pits; in dorsal view apex curved slightly mesad. Inferior appendage, subquadrangular, with posterodorsal corner produced, setose; apicomesal lobe triangular, with rounded posterior margin, with strong, spine-like setae mesally; mesal basodorsal process enlarged, triangular in distal one half, with scalloped, weakly rounded posterior margin, setose; abbreviated basal plate weak, with short, recurved process projecting caudad, with bluntly rounded, setose apex. Phallus short, curved; with symmetrical, dorsal flanges; phallotremal sclerite present.

Distribution and habitat

The single specimen was taken in a malaise trap at a fast flowing stream in the coastal forests in central Ghana.

Triaenodes scottae Gibon
(figs. 46-49)

Triaenodes scottae Gibon, 1982: 72, Figs 2, 5-6. Type locality: Ivory Coast: Kouto, Bagoué River; MNHN; ♂.
Triaenodes scottae Gibon. – Morse 1999 [electronic catalogue].

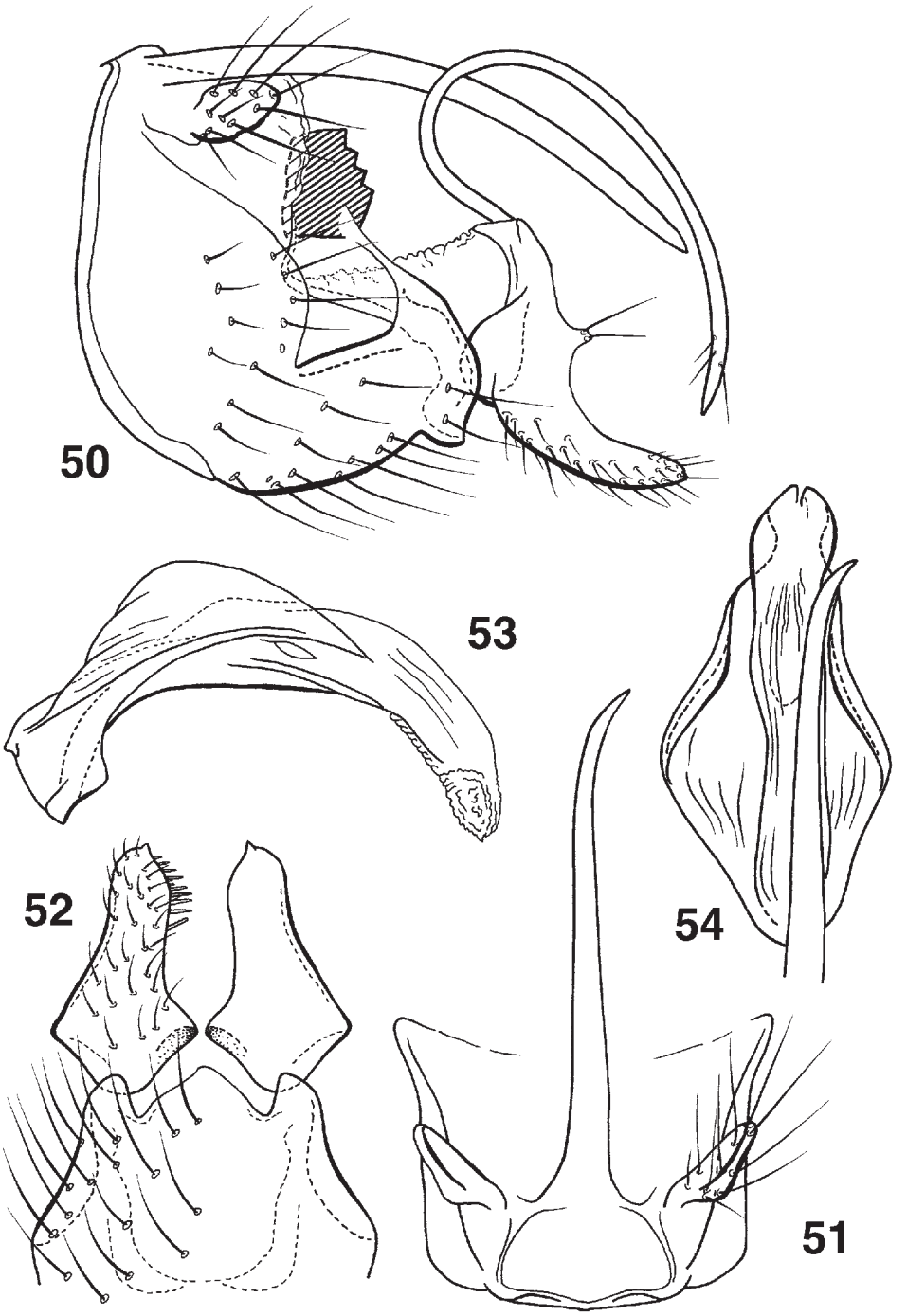
Diagnosis

The species is easily separated from other Afrotropical *Triaenodes* species on having the upper part of tergum X consisting of two pairs of very long, filiform processes and the lower part of tergum X consisting of a pair of strong, spine-like projections, which are forked at two thirds of length.

Redescription

Male (n=1-2). – Forewing length 6.7-7.0 mm, hind wing length 4.8-5.0 mm. Eye 0.35-0.37 mm wide. Antennae broken, scape 0.63-0.66 mm long. Maxillary palp segment I-III lengths (in mm): 0.52, 0.49, 0.49 [segments IV and V missing]. Colour in alcohol yellowish-brown.

Male genitalia (figs. 46-49). – Abdominal segment IX with anterior margin dorsally rounded, medially straight, ventrally broadly rounded; tergum narrow; pleural region with posterior margin rounded, semimembranous; sternum subrectangular, strongly produced posteriorly; in ventral view with rounded corners, weakly convex posterior margin. Preanal appendage narrowly subrectangular, setose. Upper part of tergum X apparently consisting of two pairs of very long, weak, filiform processes projecting caudad, with sparse short setae. Lower part of tergum X paired, strong, spine-like, projecting caudad, bifid at two thirds, dorsal branch short, tapering, ventral branch longer, tapering apically, with sparse short setae. Infe-



Figs 50-54. *Triaenodes tofanus* Gibbs, ♂ genitalia. – 50, Lateral; 51, dorsal; 52, ventral; 53, phallus, lateral; 54, upper part of tergite X and phallus, dorsal.

rior appendage narrow, curved posteroventrad, with short, spine-like setae apicomesally; lateral baso-dorsal process small, with one seta; abbreviated basal plate projecting dorsad, with strongly curved spine-like recurved process extending caudad, apex tapering with few setae. Phallus cylindrical, curved with well-developed dorsolateral flanges; phallotremal sclerite large, distinct.

Distribution and habitat

The species is known from the type locality in Ivory Coast (Gibon 1982) and from Mali.

Material examined. – MALI: Manding Mountains, near Bamako, small tributary to White Niger, 2♂, 25.ix.1985, F.M. Gibon (F.M.G.).

Triaenodes tofanus Gibbs
(figs. 50-54)

Triaenodes tofanus Gibbs, 1973: 400, figs. 110-112. Type locality: GHANA: Eastern Region, Tafo; BMNH; ♂.
Triaenodes tofanus Gibbs. – Kjærandsen & Andersen 1997: 247 [list]; Morse 1999 [electronic catalogue].

Diagnosis

The species groups with *T. elegantulus* Ulmer, *T. troubati* Gibon, and *T. akua* sp. n. in the general shape of the inferior appendage. However, the combination of short, ovate preanal appendages; strong, narrow, spine-like, weakly curved upper part of tergum X; and reduced lower part of tergum X separate the species from the other three.

Redescription

Male (n=10). – Forewing length 6.8-7.2, 7.0 mm; hind wing length 5.1-5.5, 5.3 mm. Eye 0.39-0.43, 0.41 mm wide. Antenna at least 20.4 mm long, including 0.58-0.66, 0.61 mm long scape. Maxillary palp segment lengths (in mm): 0.52-0.58, 0.55; 0.52-0.60, 0.54; 0.55-0.61, 0.57; 0.31-0.39, 0.33; 0.68-0.76, 0.71. Colour in alcohol overall light reddish-brown.

Male genitalia (figs. 50-54). – Abdominal segment IX with broadly rounded anterior margin; tergum narrow; pleural region rounded, setose; sternum subrectangular, strongly produced posteriorly, in ventral view with bluntly triangular, protruding corners and triangular apical margin. Preanal appendage short, ovate, setose. Upper part of tergum X strong, narrow, spine-like, weakly curved ventrally, with tapering apex curved to the left in dorsal view. Lower part of tergum X apparently reduced. Inferior appendage narrow, curved posteroventrad, with small tooth-like projection apically, with short, spine-like setae apicomesally; abbreviated basal plate projecting dorsad, with spine-like recurved process extending caudad, apex tapering with few setae. Phallus cylindrical, curved; with well-developed dorsolateral flanges, these slightly asymmetrical; phallotremal sclerite indistinct.

Remarks

The males from Liberia differ slightly from the Ghanaian specimens in the shape of the male genitalia, the preanal appendages being longer, the upper part of tergum X is longer and more strongly curved and the inferior appendage has a larger tooth-like projection apically. Until more material is available we consider this variation as intraspecific.

Distribution and habitat

Gibbs (1973) recorded the species from the type locality only, in the Eastern Region of Ghana. The present paper adds records from Liberia, and from the Western Region in Ghana.

In Ghana the species was taken in the south-central and southwestern forested parts of the country where it was trapped at light close to small rather fast flowing rivers.

Material examined. – GHANA: Eastern Region: Boti Falls, 20♂, 14.xi.1994, at light, NUFU-project; Western Region: Ankasa Game Production Reserve, 12♂, 16.xi.1995, at light, NUFU-project. – LIBERIA: Suakoko, 3♂ (pinned), 6 & 7.x.1952, light trap, Blickenstoff (USNM).

Triaenodes troubati Gibon
(figs. 55-58)

Triaenodes troubati Gibon, 1982: 73-74, figs. 1, 7-8. IVORY COAST: Semien, Sassandra River; MNHN; ♂.
Triaenodes troubati Gibon. – Kjærandsen & Andersen 1997: 247 [list]; Morse 1999 [electronic catalogue].

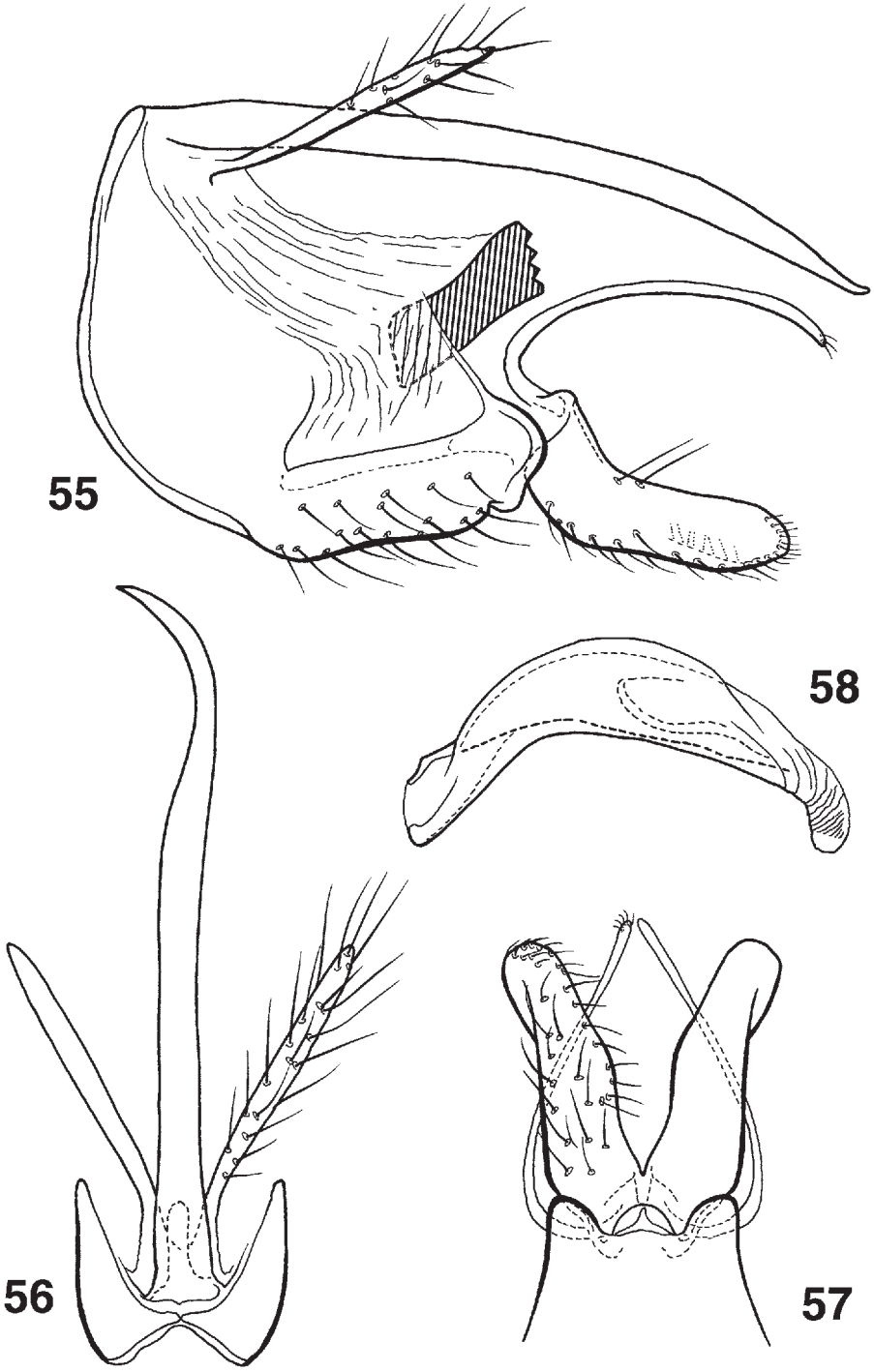
Diagnosis

The species groups with *T. elegantulus* Ulmer, *T. tofanus* Gibbs, and *T. akua* sp. n. in the general shape of the inferior appendage. However, the combination of digitate preanal appendages; strong, narrow, spine-like, weakly curved upper part of tergum X; and reduced lower part of tergum X separate the species from the other three.

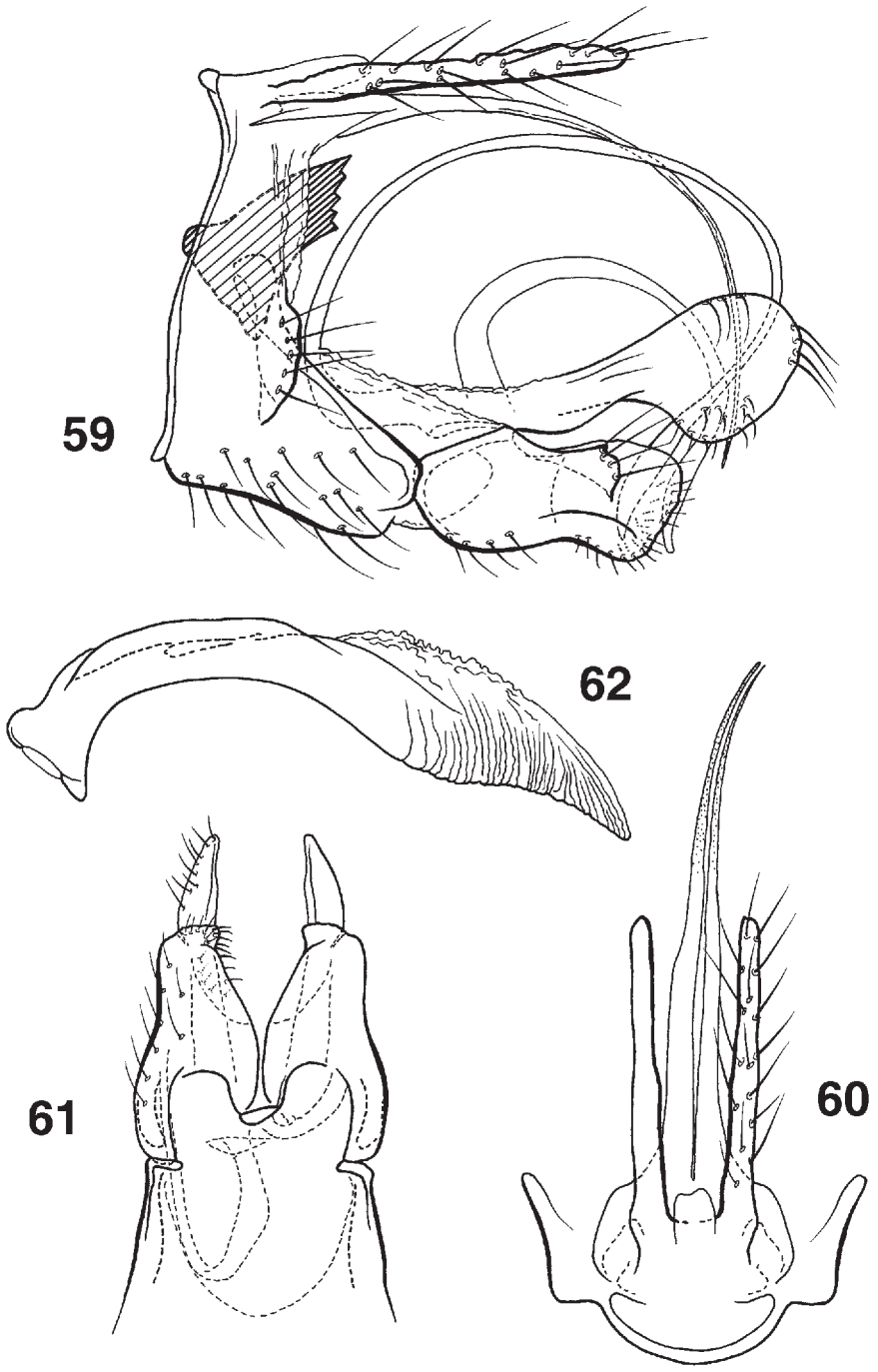
Redescription

Male (n=10). – Forewing length 6.5-7.2, 6.8 mm; hind wing length 5.1-5.7, 5.3 mm. Eye 0.34-0.39, 0.37 mm wide. Antenna at least 16.6 mm long, including 0.74-0.84, 0.80 mm long scape. Maxillary palp segment lengths (in mm): 0.55-0.61, 0.57; 0.55-0.61, 0.58; 0.50-0.56, 0.53; 0.34-0.42, 0.38; 0.64-0.77, 0.71. Colour in alcohol overall reddish-brown.

Male genitalia (figs. 55-58). Abdominal segment IX with anterior margin rounded; tergum narrow; pleural region rounded, membranous; sternum subrectangular, strongly produced posteriorly, in ventral view



Figs 55-58. *Triaenodes troubati* Gibon, ♂ genitalia. – 55, Lateral; 56, dorsal; 57, ventral; 58, phallus, lateral.



Figs 59-62. *Triaenodes yaw* sp. n., ♂ genitalia. – 59, Lateral; 60, dorsal; 61, ventral; 62, phallus, lateral.

with prominent, rounded corners, and slightly convex apical margin. Preanal appendage digitate, setose. Upper part of tergum X strong, narrow, spine-like, weakly curved ventrally; in dorsal view with tapering apex turned to the right. Lower part of tergum X apparently reduced. Inferior appendage slightly curved, with broadly rounded apex, setose; with two strong setae laterodorsally; abbreviated basal plate projecting anterodorsad, with strong recurved process extending caudad, apex rounded with few setae. Phallus slightly curved, trough-like apically, with slightly asymmetrical dorsolateral flange.

Distribution and habitat

The species is recorded from the type locality in Ivory Coast (Gibon 1982), and from Volta Region in Ghana (Kjærandsen & Andersen 1997). In Ghana it was taken in light traps close to small rather fast flowing rivers in the southeastern forested part of the country.

Material examined. – GHANA: Volta Region: Agumatsa Waterfalls, Wli, 9♂, 16-20.xi.1993, at light, NUFU-project; Volta Region: River Uwue south of Lipke Mate, 1♂, 6.xi.1995, at light, NUFU-project; Volta Region: River Hule (Nubui) south of Fodome Xelu, 1♂, 7.xi.1995, at light, NUFU-project.

Triaenodes yaw sp. n.
(figs. 59-62)

Type material. – Holotype ♂: GHANA: Volta Region: Agumatsa Waterfalls, Wli, 5.-14.iii.1993, Malaise trap, NUFU-project (UMSP). – Paratypes: 6♂ same data as holotype (USNM, ZMUB, UMSP).

Etymology. – Twi, *yaw,* meaning a male born on Thursday; named in the Ashanti tradition of naming children after the day they are born, signifying that the species description was written on a Thursday; the name is a noun in apposition.

Diagnosis

The species shows similarities to *T. africanus* Ulmer, *T. contartus* Jacquemart & Statzner and *T. kwasi* sp. n. in having a mesal basodorsal process of the inferior appendage which is enlarged apically, but can be separated from all three by the long, asymmetrical processes extending from the basal plate.

Description

Male (n=7). – Forewing length 5.2-5.5, 5.3 mm; hind wing length 4.2-4.5, 4.4 mm. Eye 0.31-0.35, 0.33 mm wide. Antenna at least 16.0 mm long, including 0.50-0.58, 0.54 mm long scape. Maxillary palp segment lengths (in mm): 0.35-0.39, 0.37; 0.56-0.63, 0.60; 0.55-0.64, 0.61; 0.42-0.52, 0.46; 0.76-0.87, 0.83. Colour in alcohol overall reddish-brown.

Male genitalia (figs. 59-62). – Abdominal segment IX with anterior margin straight; tergum narrow; pleural region dorsally membranous, ventrally weakly rounded, setose; sternum, triangular, produced posteriorly, in ventral view posterior margin with square corners, membranous mesally. Preanal appendage long, narrow, setose. Upper part of tergum X short, rounded, shallowly bilobed. Lower part of tergum X long, very narrow, curved ventrad, distal one third semi-membranous; in dorsal view split to base, both forks apically curved to the left. Inferior appendage subrectangular with small, laterodorsal ridge in distal three fourths, with thick setae mesally; mesal basodorsal lobe large, projecting posterodorsad, with enlarged, broadly rounded apical one third, setose; abbreviated basal plates asymmetrical, right side with shorter spine than left; right plate projecting anterodorsad, with thicker, strongly recurved process projecting caudad; left plate projecting anteroventrad, with slimmer, longer, strongly recurved process, both processes broadened and slightly sinuous subapically. Phallus curved, with dorsolateral flange in basal one half, with distal one half broadly triangular, membranous.

Distribution and habitat

The species was taken in light traps at a small rather fast flowing river in the southeastern forested part of Ghana.

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